ESTRO

NEWSLETTER NOVEMBER-DECEMBER

ESTRO | EUROPEAN SOCIETY FOR RADIOTHERAPY & ONCOLOGY

CLINICAL

Meet the new faces in the ESTRO clinical committee

RTT

Oncology of later life – new horizons for the radiation therapist (RTT)

RADIOBIOLOGY

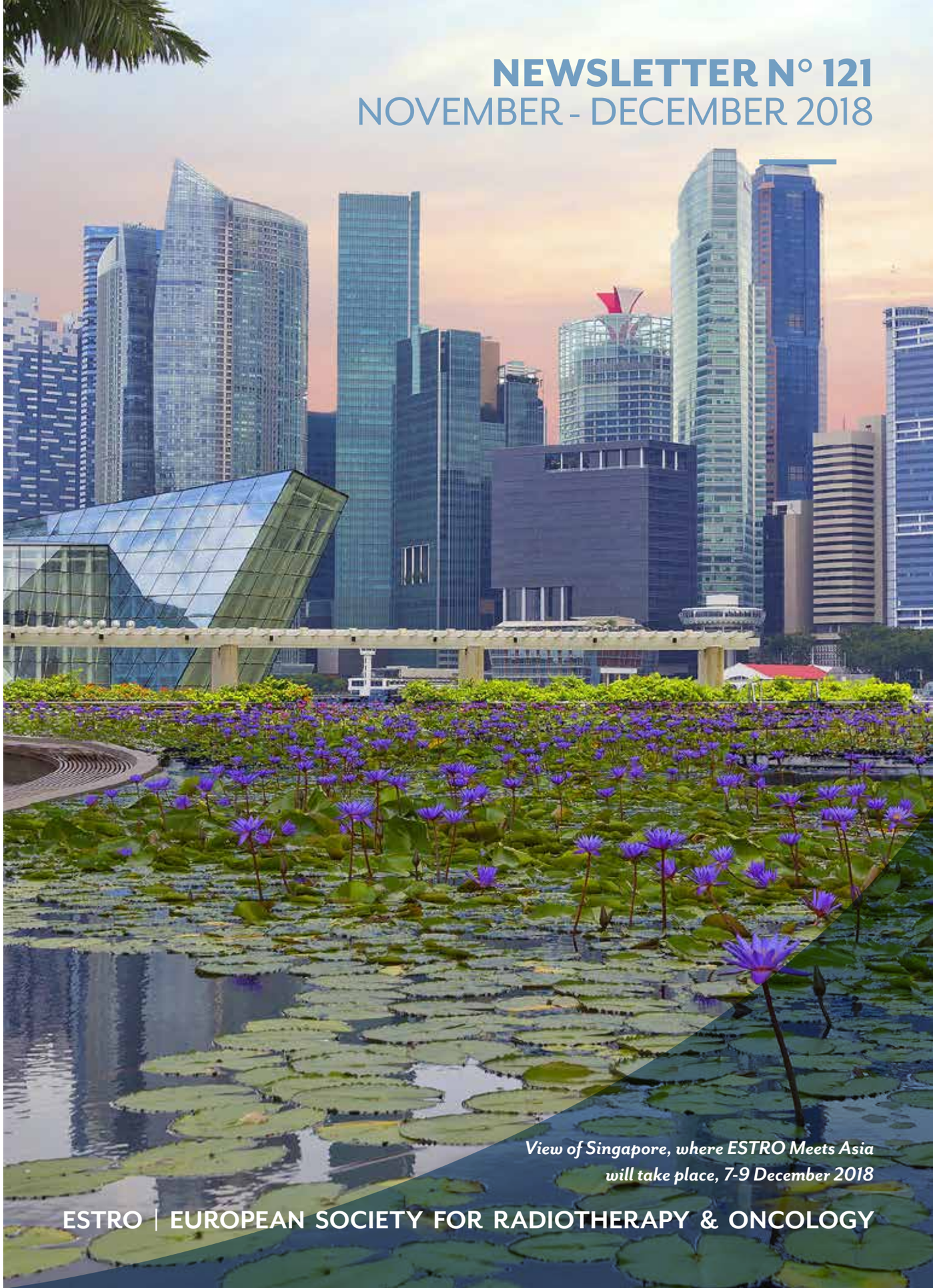
New fifth edition of 'Basic clinical radiobiology'

YOUNG ESTRO

Learning radiation oncology in Europe: results of the ESTRO multidisciplinary survey

N° 121 | BIMONTHLY | NOVEMBER - DECEMBER 2018

CONTENTS



NEWSLETTER N° 121
NOVEMBER - DECEMBER 2018

View of Singapore, where ESTRO Meets Asia will take place, 7-9 December 2018

ESTRO | EUROPEAN SOCIETY FOR RADIOTHERAPY & ONCOLOGY

EDITORIAL

"I am so happy to see such engagement with our Society, and look forward to an innovative scientific programme, focusing on our theme: "Targeting optimal care, together"

Dear ESTRO friends,

The end of the year is upon us and it is time for ESTRO to meet Asia at our first conference organised outside Europe. I'm sure that you will be very pleased to hear that it has all it takes to be a success: a large number of submitted abstracts, a varied programme featuring great speakers, and already 34 countries represented among the registered participants. All the latest information on the conference is available on the ESTRO website, but I would like to highlight the novel format of the programme, with 42 sessions in which the scientific track is combined with education, practice-oriented sessions for physicists and radiation therapists (RTTs) and oncopolicy issues.

A detailed searchable programme is available, so do check it out – there is still time to register.

I would also like to thank the many contributors to our annual meeting's scientific programme: abstract submission deadline for ESTRO 38 was

Umberto Ricardi

on 22 October 2018. The scientific programme committee will now have a lot of work ahead as we have received 2,240 abstracts! I am so happy to see such engagement with our Society, and look forward to an innovative scientific programme, focusing on our theme: “Targeting optimal care, together”.

A word also on governance: in 2019 we will elect four ESTRO board members. As you know, each member of the ESTRO board of directors serves a three-year term, which can be renewed once. In the upcoming election, a new representative for radiobiology professionals is needed, as Conchita Vens ends her second term in this position. Conchita has done tremendous work over the years, and we are truly thankful for her commitment. Representatives of ESTRO’s clinical and physics members will also stand for election, so we hope that our ESTRO membership once again engages in choosing their dedicated representatives. We will come back to you soon with more details on the names running for each position, as well as with a timeline for the electronic election process.

One last note from me: the 2019 ESTRO guide is now available. Don’t forget to take a look, so that you can plan ahead for your ESTRO activities next year.
It will be a busy end to 2018, let’s enjoy it!

Best wishes,

Umberto Ricardi
ESTRO President

ESTRO board elections

25 February - 17 March 2019

Stay tuned at the beginning of 2019 for more details, and don’t forget to renew your membership - only 2019 full members will be eligible to vote!

READ IT BEFORE YOUR PATIENTS

READ IT BEFORE YOUR PATIENTS

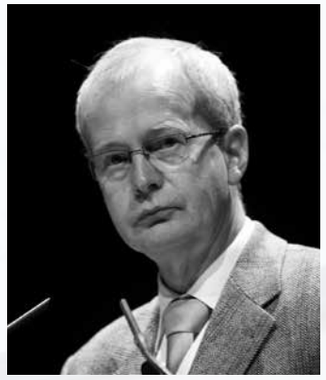
Too important to miss...

A digest of essential reading for all radiation oncologists

BY PHILIPPE LAMBIN, DIRK DE RUYSSCHER AND HANS KAANDERS

PHILIPPE LAMBIN

DIRK DE RUYSSCHER



HANS KAANDERS

READ IT BEFORE YOUR PATIENTS

BREAST

Predictors for poor cosmetic outcome in patients with early stage breast cancer treated with breast conserving therapy: results of the Young Boost trial

Brouwers PJAM, van Werkhoven E, Bartelink H, Fourquet A, Lemanski C, van Loon J, Maduro JH, Russell NS, Scheijmans LJEE, Schinagl DAX8 Westenberg AH, Poortmans P, Boersma LJ; Young Boost Trial research group.

Radiother Oncol. 2018 Sep;128(3):434-441. doi: 10.1016/j.radonc.2018.06.020. Epub 2018 Jul 3.

Purpose

In the Young Boost trial (YBT), breast cancer patients ≤50 years of age, treated with breast conserving therapy (BCT) were randomised between a 26 Gy boost dose and a 16 Gy boost dose, with local recurrence as primary and cosmetic outcome (CO) as secondary endpoint. Data from the YBT was used to investigate which factors are related with worse cosmetic outcome after BCT.

Methods

From 2004 to 2011, 2,421 cT1-2N0-2a breast cancer patients were randomised. CO was scored subjectively by the patient and physician, and objectively using BCCT.core at baseline, one and four years after treatment. Associations between potential risk factors for worse cosmetic outcome, based on the objective BCCT.core, were investigated using a proportional odds model.

Results

At four years, CO was significantly better in the standard boost group for all three scoring methods (satisfied CO ±65% vs 55%). A photon boost, high boost dose, poor cosmesis before radiation therapy, large boost volume and adjuvant chemotherapy significantly deteriorated CO.

Conclusion

Important risk factors for worse CO were the use of a photon boost instead of an electron boost, a high boost dose, cosmesis at baseline, adjuvant chemotherapy and boost volume. These results can be used to define strategies aimed at improving CO.

READ IT BEFORE YOUR PATIENTS

BREAST

Close margins less than 2mm are not associated with higher risks of 10-year local recurrence and breast cancer mortality compared with negative margins in women treated with breast-conserving therapy

Tyler S, Truong PT, Lesperance M, Nichol A, Baliski C, Warburton R, Tyldesley S.

Int J Radiat Oncol Biol Phys. Volume 101, Issue 3, Pages 661–670
doi: https://doi.org/10.1016/j.ijrobp.2018.03.005

Purpose
The 2014 Society of Surgical Oncology-American Society for Radiation Oncology consensus suggested "no ink on tumour" is a sufficient surgical margin for invasive breast cancer treated with breast-conserving surgery (BCS). Whether close margins <2 mm are associated with inferior outcomes remains controversial. This study evaluated ten-year outcomes by margin status in a population-based cohort treated with BCS and adjuvant radiation therapy (RT).

Methods and materials
The subjects were 10,863 women with invasive cancer categorised as pT1 to T3, any N, and M0 referred from 2001 to 2011, an era in which the institutional policy was to re-excise close or positive margins, except in select cases. All women underwent BCS and whole-breast RT with or without boost RT. Local recurrence (LR) and breast cancer-specific survival (BCSS) were examined using competing-risk analysis in cohorts with negative (≥2 mm; n = 9241, 85%), close (<2 mm; n = 1310, 12%), or positive (tumour touching ink; n = 312, 3%) margins. Multivariable analysis and matched-pair analysis were performed.

Results
The median follow-up period was eight years. Systemic therapy was used in 87% of patients. Boost RT was used in 34.1%, 76.9%, and 79.5% of patients with negative, close, and positive margins, respectively. In the negative, close, and positive margin cohorts, the ten-year cumulative incidence of LR was 1.8%, 2.0%, and 1.1%, respectively (P = .759). Corresponding BCSS estimates were 93.9%, 91.8%, and 87.9%, respectively (P < .001). On multivariable analysis, close margins were not associated with increased LR (hazard ratio, 1.25; 95% confidence interval 0.79-1.97; P = .350) or reduced BCSS (hazard ratio, 1.25; 95% confidence interval 0.98-1.58, P = .071) relative to negative margins. On matched-pair analysis, close margin cases had similar LR (P = .114) and BCSS (P = .100) to negative margin controls.

Conclusions
Select cases with close or positive margins in this population-based analysis had similar LR and BCSS to cases with negative margins. While these findings do not endorse omitting re-excision for all cases, the data support a policy of accepting carefully selected cases with close margins for adjuvant RT without re-excision.

READ IT BEFORE YOUR PATIENTS

PROSTATE

Development of an isotoxic decision support system integrating genetic markers of toxicity for the implantation of a rectum spacer

van Wijk Y, Vanneste BGL, Jochems A, Walsh S, Oberije CJ, Pinkawa M, Ramaekers BLT, Vega A, Lambin P.

Acta Oncol. 2018 Jun 28:1-7. doi: 10.1080/0284186X.2018.1484156. [Epub ahead of print]

Introduction

Previous studies revealed that dose escalated radiotherapy for prostate cancer patients leads to higher tumour control probabilities (TCP) but also to higher rectal toxicities. An isotoxic model was developed to maximise the given dose while controlling the toxicity level. This was applied to analyse the effect of an implantable rectum spacer (IRS) and extended with a genetic test of normal tissue radio-sensitivity. A virtual IRS (V-IRS) was tested using this method. We hypothesised that the patients with increased risk of toxicity would benefit more from an IRS.

Material and methods

Sixteen localised prostate cancer patients implanted with an IRS were included in the study. Treatment planning was performed on computed tomography (CT) images before and after the placement of the IRS and with a V-IRS. The normal tissue complication probability (NTCP) was calculated using a QUANTEC-reviewed model for grade >=2 late rectal bleeding and the number of fractions of the plans were adjusted until the NTCP value was under 5%. The resulting treatment plans were used to calculate the TCP before and after placement of an IRS. This was extended by adding the effect of two published genetic single nucleotide polymorphisms (SNPs) for late rectal bleeding.

Results

The median TCP resulting from the optimised plans in patients before the IRS was 75.1% [32.6-90.5%]. With IRS, the median TCP is significantly higher: 98.9% [80.8-99.9%] ($p < .01$). The difference in TCP between the V-IRS and the real IRS was 1.8% [0.0-18.0%]. Placing an IRS in the patients with SNPs improved the TCP from 49.0% [16.1-80.8%] and 48.9% [16.0-72.8%] to 96.3% [67.0-99.5%] and 90.1% [49.0-99.5%] ($p < .01$) respectively for either SNP.

Conclusion

This study was a proof-of-concept for an isotoxic model with genetic biomarkers with a V-IRS as a multifactorial decision support system for the decision of a placement of an IRS.

READ IT BEFORE YOUR PATIENTS

PROSTATE

Randomised trial of hypofractionated, dose-escalated, intensity-modulated radiation therapy (IMRT) versus conventionally fractionated IMRT for localised prostate cancer

Hoffman KE, Voong KR, Levy LB, Allen PK, Choi S, Schlembach PJ, Lee AK, McGuire SE, Nguyen Q, Pugh TJ, Frank SJ, Kudchadker RJ, Du W, Kuban DA.
J Clin Oncol. 2018 Aug 14:JCO2018779868. doi: 10.1200/JCO.2018.77.9868. [Epub ahead of print]

Purpose

Hypofractionated radiotherapy delivers larger daily doses of radiation and may increase the biologically effective dose delivered to the prostate. We conducted a randomised trial testing the hypothesis that dose-escalated, moderately hypofractionated intensity-modulated radiation therapy (HIMRT) improves prostate cancer control compared with conventionally fractionated IMRT (CIMRT) for men with localised prostate cancer.

Patients and methods

Men were randomly assigned to 75.6 Gy in 1.8-Gy fractions delivered over 8.4 weeks (CIMRT) or 72 Gy in 2.4 Gy fractions delivered over six weeks (HIMRT, biologically equivalent to 85 Gy in 1.8-Gy fractions assuming prostate cancer α-to-β ratio of 1.5). Failure was defined as prostate-specific antigen (PSA) failure (nadir plus 2 ng/mL) or initiation of salvage therapy. Modified Radiation Therapy Oncology Group criteria were used to grade late (≥ 90 days after completion of radiotherapy) GI and genitourinary toxicity.

Results

Most of the 206 men (72%) had cT1, Gleason score 6 or 7 (99%), and PSA level ≤ 10 ng/mL (90%) disease. Androgen deprivation therapy was received by 24%. With a median follow-up of 8.5 years, men treated with HIMRT experienced fewer treatment failures (n = 10) than men treated with CIMRT (n = 21; P = .036). The eight-year failure rate was 10.7% (95% CI, 5.8% to 19.1%) with HIMRT and 15.4% (95% CI, 9.1% to 25.4%) with CIMRT. There was no difference in overall survival (P = .39). There was a non-significant increase in late grade 2 or 3 GI toxicity with HIMRT (8-year 5.0% vs 12.6%; P = .08). However, GI toxicity was only 8.6% when rectal volume receiving 65 Gy of HIMRT was ≤ 15%. Late genitourinary toxicity was similar (P = .84). There was no grade 4 toxicity.

Conclusion

The results of this randomised trial demonstrate superior cancer control for men with localised prostate cancer who receive dose-escalated moderately hypofractionation radiotherapy while shortening treatment duration.

READ IT BEFORE YOUR PATIENTS

HEAD AND NECK

Induction chemotherapy followed by cetuximab radiotherapy is not superior to concurrent chemoradiotherapy for head and neck carcinomas: results of the GORTEC 2007-02 phase III randomised trial

Geoffrois L, Martin L, De Raucourt D, Sun XS, Tao Y, Maingon P, Buffet J, Pointreau Y, Sire C, Tuchais C, Babin E, Coutte A, Rolland F, Kaminsky MC, Alfonsi M, Lapeyre M, Saliou M, Lafond C, Jadaud E, Gery B, Zawadi A, Tourani JM, Khoury C, Henry AR, Hasbini A, Guichard F, Borel C, Meert N, Guillet P, Calais MH, Garaud P, Bourhis J.

J Clin Oncol. 2018 Jul 17:JCO2017762591. doi: 10.1200/JCO.2017.76.2591. [Epub ahead of print]

Purpose

Both concurrent chemoradiotherapy (CT-RT) and cetuximab radiotherapy (cetux-RT) have been established as the standard of care for the treatment of locally advanced squamous cell carcinoma of the head and neck. It was not known whether the addition of induction chemotherapy before cetux-RT could improve outcomes compared with standard of care CT-RT.

Patients and methods

The current trial was restricted to patients with non-metastatic N2b, N2c, or N3 squamous cell carcinoma of the head and neck and fit for taxotere, cisplatin, fluorouracil (TPF). Patients were randomly assigned to receive three cycles of TPF followed by cetux-RT versus concurrent carboplatin fluorouracil and RT as recommended in National Comprehensive Cancer Network guidelines. The trial was powered to detect a hazard ratio (HR) of 0.66 in favour of TPF plus cetux-RT for progression-free survival at two years. The inclusion of 180 patients per arm was needed to achieve 80% power at a two-sided significance level of .05.

Results

Between 2009 and 2013, 370 patients were included. All patients and tumours characteristics were well balanced between arms. There were more cases of grade 3 and 4 neutropenia in the induction arm, and the induction TPF was associated with 6.6% treatment-related deaths. With a median follow-up of 2.8 years, two-year progression-free survival was not different between both arms (CT-RT, 0.38 vs TPF + cetux-RT, 0.36; HR, 0.93 [95% CI, 0.73 to 1.20]; P = .58). HR was 0.98 (95% CI, 0.74 to 1.3; P = .90) for locoregional control and 1.12 (95% CI, 0.86 to 1.46; P = .39) for overall survival. These effects were observed regardless of p16 status. The rate of distant metastases was lower in the TPF arm (HR, 0.54 [95% CI, 0.30 to 0.99]; P = .05).

Conclusion

Induction TPF followed by cetux-RT did not improve outcomes compared with CT-RT in a population of patients with advanced cervical lymphadenopathy.

READ IT BEFORE YOUR PATIENTS

HEAD AND NECK

Implications of improved diagnostic imaging of small nodal metastases in head and neck cancer: radiotherapy target volume transformation and dose de-escalation

van den Bosch S, Vogel WV, Raaijmakers CP, Dijkema T, Terhaard CHJ, Al-Mamgani A, Kaanders JHAM.

Radiother Oncol. 2018 Sep;128(3):472-478. doi: 10.1016/j.radonc.2018.04.020. Epub 2018 May 3.

Summary

Diagnostic imaging continues to evolve, and now has unprecedented accuracy for detecting small nodal metastasis. This influences the tumour load in elective target volumes and subsequently has consequences for the radiotherapy dose required to control disease in these volumes. Small metastases that used to remain subclinical and were included in elective volumes will nowadays be detected and included in high-dose volumes. Consequentially, high-dose volumes will more often contain low-volume disease. These target volume transformations lead to changes in the tumour burden in elective and "gross" tumour volumes with implications for the radiotherapy dose prescribed to these volumes.

For head and neck tumours, nodal staging has evolved from mere palpation to combinations of high-resolution imaging modalities. A traditional nodal gross tumour volume in the neck typically had a minimum diameter of 10-15 mm, while nowadays much smaller tumour deposits are detected in lymph nodes. However, the current dose levels for elective nodal irradiation were empirically determined in the 1950s and have not changed since.

In this report the radiobiological consequences of target volume transformation caused by modern imaging of the neck are evaluated, and theoretically derived reductions of dose in radiotherapy for head and neck cancer are proposed. The concept of target volume transformation and subsequent strategies for dose adaptation applies to many other tumour types as well. Awareness of this concept may result in new strategies for target definition and selection of dose levels with the aim to provide optimal tumour control with less toxicity.

READ IT BEFORE YOUR PATIENTS

BRAIN

Endocrine deficiency as a function of radiation dose to the hypothalamus and pituitary in paediatric and young adult patients with brain tumours

Vatner RE, Niemierko A, Misra M, Weyman EA, Goebel CP, Ebb DH, Jones RM, Huang MS, Mahajan A, Grosshans DR, Paulino AC, Stanley T, MacDonald SM, Tarbell NJ, Yock TI.

J Clin Oncol. 2018 [Epub ahead of print].

Purpose

There are sparse data defining the dose response of radiation therapy (RT) to the hypothalamus and pituitary in paediatric and young adult patients with brain tumours. We examined the correlation between RT dose to these structures and development of endocrine dysfunction in this population.

Materials and methods

Dosimetric and clinical data were collected from children and young adults (< 26 years of age) with brain tumours treated with proton RT on three prospective studies (2003 to 2016). Deficiencies of growth hormone (GH), thyroid hormone, adrenocorticotropic hormone, and gonadotropins were determined clinically and serologically. Incidence of deficiency was estimated using the Kaplan-Meier method. Multivariate models were constructed accounting for radiation dose and age.

Results

Of 222 patients in the study, 189 were evaluable by actuarial analysis, with a median follow-up of 4.4 years (range, 0.1 to 13.3 years), with 31 patients (14%) excluded from actuarial analysis for having baseline hormone deficiency and two patients (0.9%) because of lack of follow-up. In total, 130 patients (68.8%) with medulloblastoma were treated with craniospinal irradiation (CSI) and boost; most of the remaining patients (n = 56) received involved field radiation therapy (RT), most commonly for ependymoma (13.8%; n = 26) and low-grade glioma (7.4%; n = 14). The four-year actuarial rate of any hormone deficiency, growth hormone, thyroid hormone, adrenocorticotropic hormone, and gonadotropin deficiencies were 48.8%, 37.4%, 20.5%, 6.9%, and 4.1%, respectively. Age at start of RT, time interval since treatment, and median dose to the combined hypothalamus and pituitary were correlated with increased incidence of deficiency.

Conclusion

Median hypothalamic and pituitary radiation dose, younger age, and longer follow-up time were associated with increased rates of endocrinopathy in children and young adults treated with radiotherapy for brain tumours.

READ IT BEFORE YOUR PATIENTS

GLIOMAS

Bevacizumab and temozolomide in patients with first recurrence of WHO grade II and III glioma, without 1p/19q co-deletion (TAVAREC): a randomised controlled phase 2 EORTC trial

van den Bent MJ, Klein M, Smits M, Reijneveld JC, French PJ, Clement P, de Vos FYF, Wick A, Mulholland PJ, Taphoorn MJB, Lewis J, Weller M, Chinot OL, Kros JM, de Heer I, Verschuere T, Coens C, Golfinopoulos V, Gorlia T, Idbaih A.

Lancet Oncol. 2018 Sep;19(9):1170-1179. doi: 10.1016/S1470-2045(18)30362-0. Epub 2018 Aug 13.

Background

Bevacizumab is frequently used in the treatment of recurrent World Health Organization (WHO) grade II and III glioma, but without supporting evidence from randomised trials. Therefore, we assessed the use of bevacizumab in patients with first recurrence of grade II or III glioma who did not have 1p/19q co-deletion.

Methods

The TAVAREC trial was a randomised, open-label phase 2 trial done at 32 centres across Europe in patients with locally diagnosed grade II or III glioma without 1p/19q co-deletion, with a first and contrast-enhancing recurrence after initial radiotherapy or chemotherapy, or both. Previous chemotherapy must have been stopped at least six months before enrolment and radiotherapy must have been stopped at least three months before enrolment. Random group assignment was done electronically through the European Organisation for Research and Treatment of Cancer web-based system, stratified by a minimisation procedure using institution, initial histology (WHO grade II vs III), WHO performance status (0 or 1 vs 2), and previous treatment (radiotherapy, chemotherapy, or both). Patients were assigned to receive either temozolomide (150-200 mg/m2, orally) monotherapy on days 1-5 every four weeks for a maximum of 12 cycles, or the same temozolomide regimen in combination with bevacizumab (10 mg/kg, intravenously) every two weeks until progression. The primary endpoint was overall survival at 12 months in the per-protocol population. Safety analyses were done in all patients who started their allocated treatment. The study is registered at EudraCT (2009-017422-39) and ClinicalTrials.gov (NCT01164189), and is complete.

Findings

Between 8 February 2011 and 31 July 2015, 155 patients were enrolled and randomly assigned to receive either monotherapy (n=77) or combination therapy (n=78). Overall survival in the per-protocol population at 12 months was achieved by 44 (61% [80% CI 53-69]) of 72 patients in the temozolomide group and 38 (55% [47-69]) of 69 in the combination group. The most frequent toxicity was haematological: 17 (23%) of 75 patients in the monotherapy group and 25 (33%) of 76 in the combination group developed grade 3 or 4 haematological toxicity. Other than haematological toxicities, the most common adverse events were nervous system disorders (59 [79%] of 75 patients in the monotherapy group vs 65 [86%] of 76 in the combination group), fatigue (53 [70%] vs 61 [80%]), and nausea (39 [52%] vs 43 [56%]). Infections were more frequently reported in the combination group (29 [38%] of 76 patients) than in the monotherapy group (17 [23%] of 75). One treatment-related death was reported in the combination group ▼

(infection after intratumoural haemorrhage during a treatment-related grade 4 thrombocytopenia).

Interpretation

We found no evidence of improved overall survival with bevacizumab and temozolomide combination treatment versus temozolomide monotherapy. The findings from this study provide no support for further phase 3 studies on the role of bevacizumab in this disease.

READ IT BEFORE YOUR PATIENTS

THYROID

Investigation of the relationship between radiation dose and gene mutations and fusions in post-Chernobyl thyroid cancer

Efanov AA, Brenner AV, Bogdanova TI, Kelly LM, Liu P, Little MP, Wald AI, Hatch M, Zurnadzy LY, Nikiforova MN, Drozdovitch V, Leeman-Neill R, Mabuchi K, Tronko MD, Chanock SJ, Nikiforov YE.

J Natl Cancer Inst. 2018 Apr 1;110(4):371-378. doi: 10.1093/jnci/djx209.

Background

Exposure to ionising radiation during childhood is a well-established risk factor for thyroid cancer. However, the genetic mechanisms of radiation-associated carcinogenesis are not fully understood.

Methods

In this study, we used targeted next-generation sequencing and RNA-Seq to study 65 papillary thyroid cancers (PTCs) from patients in the Ukrainian-American cohort with measurement-based iodine-131 (I-131) thyroid doses received as a result of the Chernobyl accident. We fitted linear regression models to evaluate differences in distribution of risk factors for PTC according to type of genetic alteration and logistic regression models to evaluate the I-131 dose response. All statistical tests were two-sided.

Results

Driver mutations were identified in 96.9% of these thyroid cancers, including point mutations in 26.2% and gene fusions in 70.8% of cases. Novel driver fusions such as POR-BRAF, as well as STRN-ALK fusions that have not been implicated in radiation-associated cancer before, were found. The mean I-131 dose in cases with point mutations was 0.2 Gy (range = 0.013-1.05 Gy), statistically significantly lower than 1.4 Gy (range = 0.009-6.15 Gy) for cases with fusions ($P < .001$). No driver point mutations were found in tumours from individuals who received more than 1.1 Gy of radiation. Relative to tumours with point mutations, the proportion of tumours with gene fusions increased with radiation dose, reaching 87.8% among individuals exposed to 0.3 Gy or higher. With a limited study sample, the estimated odds ratio at 1 Gy was 20.01 (95% confidence interval = 2.57 to 653.02, $P < .001$). In addition, after controlling for I-131 dose, we found higher odds ratios for gene fusion-positive PTCs associated with several specific demographic and geographic features.

Conclusions

Our data provide support for a link between I-131 thyroid dose and generation of carcinogenic gene fusions, the predominant mechanism of thyroid cancer associated with radiation exposure from the Chernobyl accident.

READ IT BEFORE YOUR PATIENTS

LYMPHOMA

Randomised trial of systemic therapy after involved-field radiotherapy in patients with early-stage follicular lymphoma: TROG 99.03

MacManus M, Fisher R, Roos D, O'Brien P, Macann A, Davis S, Tsang R, Christie D, McClure B, Joseph D, Jayamohan J, Seymour JF.

J Clin Oncol. 2018 Jul 5:JCO2018779892. doi: 10.1200/JCO.2018.77.9892. PMID:29975623

Purpose

Follicular lymphoma (FL) is curable by involved-field radiotherapy (IFRT) in < 50% of patients with stage I to II disease. We hypothesised that adding systemic therapy to IFRT would improve long-term progression-free survival (PFS).

Patients and methods

A multicentre randomised controlled trial enrolled patients with stage I to II low-grade FL after staging computed tomography scans and bone marrow biopsies. 18F-labeled fluorodeoxyglucose-positron emission tomography (PET) was not mandatory. Patients were randomly assigned to either arm A (30 Gy IFRT alone) or arm B (IFRT plus six cycles of cyclophosphamide, vincristine, and prednisolone [CVP]). From 2006, rituximab was added to arm B (R-CVP).

Results

Between 2000 and 2012, 150 patients were enrolled, 75 per arm. In arm B, 44 patients were allocated to receive CVP and 31 were allocated to receive R-CVP. At randomisation, 75% had stage I, the median age was 57 years, 52% were male, and 48% were PET staged. With a median follow-up of 9.6 years (range, 3.1 to 15.8 years), PFS was superior in arm B (hazard ratio, 0.57; 95% CI, 0.34 to 0.95; P = .033). Ten-year PFS rates were 59% (95% CI, 46% to 74%) and 41% (95% CI, 30% to 57%) for arms B and A, respectively. Patients in arm B who received R-CVP had markedly superior PFS compared with contemporaneous patients in arm A (hazard ratio, 0.26; 95% CI, 0.07 to 0.97; P = .045). Fewer involved regions (P = .047) and PET staging (P = .056) were associated with better PFS. Histologic transformation occurred in four and ten patients in arms B and A, respectively (P = .1). Ten deaths occurred in arm A versus five in arm B, but overall survival was not significantly different (P = .40; 87% and 95% at ten years, respectively).

Conclusion

Systemic therapy with R-CVP after IFRT reduced relapse outside radiation fields and significantly improved PFS. IFRT followed by immunochemotherapy is more effective than IFRT in early-stage FL.

READ IT BEFORE YOUR PATIENTS

OESOPHAGUS

Neoadjuvant chemoradiotherapy followed by surgery versus surgery alone for locally advanced squamous cell carcinoma of the oesophagus (NEOCRTEC5010): a phase III multicentre, randomised, open-label clinical trial.

Yang H, Liu H, Chen Y, Zhu C, Fang W, Yu Z, Mao W, Xiang J, Han Y, Chen Z, Yang H, Wang J, Pang Q, Zheng X, Yang H, Li T, Lordick F, D'Journo XB, Cerfolio RJ, Korst RJ, Novoa NM, Swanson SJ, Brunelli A, Ismail M, Fernando HC, Zhang X, Li Q, Wang G, Chen B, Mao T, Kong M, Guo X, Lin T, Liu M, Fu J; AME Thoracic Surgery Collaborative Group.

J Clin Oncol. 2018 Aug 8:JCO2018791483. doi: 10.1200/JCO.2018.79.1483. [Epub ahead of print]

Purpose

The efficacy of neoadjuvant chemoradiotherapy (NCRT) plus surgery for locally advanced oesophageal squamous cell carcinoma (ESCC) remains controversial. In this trial, we compared the survival and safety of NCRT plus surgery with surgery alone in patients with locally advanced ESCC.

Patients and methods

From June 2007 to December 2014, 451 patients with potentially resectable thoracic ESCC, clinically staged as T1-4N1M0/T4N0M0, were randomly allocated to NCRT plus surgery (group CRT; n = 224) and surgery alone (group S; n = 227). In group CRT, patients received vinorelbine 25 mg/m2 intravenously (IV) on days 1 and 8 and cisplatin 75 mg/m2 IV day 1, or 25 mg/m2 IV on days 1 to 4 every three weeks for two cycles, with a total concurrent radiation dose of 40.0 Gy administered in 20 fractions of 2.0 Gy on five days per week. In both groups, patients underwent McKeown or Ivor Lewis oesophagectomy. The primary end point was overall survival.

Results

The pathologic complete response rate was 43.2% in group CRT. Compared with group S, group CRT had a higher R0 resection rate (98.4% vs 91.2%; P = .002), a better median overall survival (100.1 months vs 66.5 months; hazard ratio, 0.71; 95% CI, 0.53 to 0.96; P = .025), and a prolonged disease-free survival (100.1 months vs 41.7 months; hazard ratio, 0.58; 95% CI, 0.43 to 0.78; P < .001). Leukopenia (48.9%) and neutropenia (45.7%) were the most common grade 3 or 4 adverse events during chemoradiotherapy. Incidences of postoperative complications were similar between groups, with the exception of arrhythmia (group CRT: 13% vs group S: 4.0%; P = .001). Peri-treatment mortality was 2.2% in group CRT versus 0.4% in group S (P = .212).

Conclusion

This trial shows that NCRT plus surgery improves survival over surgery alone among patients with locally advanced ESCC, with acceptable and manageable adverse events.

READ IT BEFORE YOUR PATIENTS

LUNG

Stereotactic body radiation therapy versus conventionally fractionated radiation therapy for early stage non-small cell lung cancer

Haque W, Verma V, Polamraju P, Farach A, Butler EB, Teh BS.

Radiother Oncol. 2018 Jul 18. pii: S0167-8140(18)33395-4. doi: 10.1016/j.radonc.2018.07.008. [Epub ahead of print]

Purpose

To date, no published randomised trials have shown stereotactic body radiation therapy (SBRT) to offer superior outcomes to conventionally fractionated radiation therapy (CFRT) for early-stage non-small cell lung cancer (NSCLC). The largest study to date, this investigation of a contemporary national database sought to evaluate practice patterns and survival between CFRT and SBRT.

Methods

The National Cancer Database was queried (2004-2015) for histologically-confirmed cT1-2aN0M0 NSCLC undergoing definitive CFRT or SBRT. Multivariable logistic regression ascertained factors associated with SBRT administration. Kaplan-Meier analysis evaluated overall survival (OS) before and following propensity matching. Cox proportional hazards modelling determined variables associated with OS.

Results

Of 23,088 patients, 2,286 (10%) patients received CFRT and 20,802 (90%) SBRT. SBRT was less often delivered in African-Americans, patients with lower incomes, urban location, greater comorbidities, at non-academic centres, in larger tumours, and squamous histology ($p < 0.05$ for all). Patients treated with SBRT had a higher median OS (38.8 months vs 28.1 months, $p < 0.001$). At median follow-up of 44.6 months, the median OS for the SBRT group was 38.8 months, versus 28.1 months for CFRT ($p < 0.001$). These findings persisted following propensity matching. Sub-group analyses demonstrated improved OS in multiple sub-cohorts (T2, Charlson comorbidity score 2-3, squamous histology). SBRT was also independently associated with OS on Cox multivariate analysis ($p < 0.001$).

Conclusions

The largest such study to date (comprising over 23,000 patients), this investigation demonstrates the survival benefit to ablative radiotherapy for early-stage NSCLC. Maturation of comparative prospective trials is eagerly awaited.

More information in the Conferences Corner on page 117 >

Lower GI – Technical and clinical challenges for radiation oncologists

20-22 March 2019 | Amsterdam, The Netherlands

Early registration deadline: 19 December 2018

Learn all about radiation therapy and how to improve it for anal and rectal cancer on this interactive course. It covers planning, delivering and monitoring radiation therapy using modern technologies on their own or in combination with other systemic treatments.

COURSE AIM

The aim of the course is to provide an interactive educational set-up to learn, understand and possibly improve the major steps of radiation therapy practice for anal and rectal cancer, including planning, delivering and monitoring radiation therapy by use of modern radiation technologies and techniques (IMRT, IGRT). In a truly interactive atmosphere, participants will be able to identify the major uncertainties of daily practice and learn how to handle them. Participants will also learn how radiation therapy for anal and rectal cancer is best combined with chemotherapy and (possibly) molecularly targeted agents. The most relevant ongoing questions in multidisciplinary management of rectal cancer, including aspects of modern imaging and innovative surgical approaches, will be addressed.

More information: www.estro.org/school >

Upper GI – technical and clinical challenges for radiation oncologists

23-26 March 2019 | Amsterdam, The Netherlands

Early registration deadline: 22 December 2018

Upper GI tumours have a very unfavourable prognosis and could benefit from technological innovation. This course will help you to understand the proper indications for radiation therapy from a multidisciplinary perspective, appropriate prescribing, tailored delineation, dose distribution and optimisation, best use of IGRT technologies and proper monitoring of tumour response.

COURSE AIM

The improvement of technology opportunities in radiation oncology challenges the role of radiotherapy in many tumour sites. Upper GI tumours share a very unfavourable prognosis and in the meantime they could benefit from technology innovation.

More information: www.estro.org/school >

CLINICAL

CLINICAL

Meet the new faces in the ESTRO clinical committee

Professor Dr Karin Haustermans at the Catholic University of Leuven, Belgium, became the new chair of the ESTRO clinical committee this year, taking over from Professor Daniel Zips. Below, Prof Haustermans gives a brief summary of her activities in ESTRO. The committee has also welcomed several other new members, listed on the next page.

KARIN HAUSTERMANS

A long time ago I trained in the department of Professor Dr Emmanuel van der Schueren, known as 'Manu'. When I was in training as a resident in radiation oncology, the ESTRO office was located in the Department of Radiation Oncology at the University Hospital of Leuven. There, Manu had a visionary and indispensable role in the founding of ESTRO. During that period I had daily contact with Germaine Heeren and Lea Minnen. Together with Manu, they introduced me to the wonderful world of ESTRO. A few years later, when I worked at The Netherlands Cancer Institute under the leadership of Harry Bartelink, I was invited to the San Miniato meeting. Jens Overgaard played a crucial role in the organisation of this meeting. I still wonder how he succeeded in bringing together "the young bright guys" of ESTRO as he used to call us (there were no gender issues at that time!). Over the years, many of them became good friends of mine and most had, or now have, a governance role in ESTRO. For me, it was the start of an almost-lifelong professional involvement in the Society, thanks to the support of the ESTRO giants in radiation oncology. Over the years I have served ESTRO in many different ways: as a member of scientific, organisation and clinical committees, as an abstract reviewer, treasurer, and as a work package coordinator for the European Particle Therapy Network (EPTN).

I am very proud to be a member of ESTRO and I am very grateful to ESTRO for awarding me the Breur medal. I always enjoy my ESTRO work and interacting with my many great colleagues ("Radiation oncology: optimal health for all, together!"). I look forward to fully committing myself to my role as chair of the clinical committee and member of the scientific council.

BIOGRAPHY

Karin Haustermans graduated in 1987 as a Doctor in Medicine, Surgery and Obstetrics (MD) from the Catholic University of Leuven (KU Leuven) in Belgium. In 1993, she completed her training and qualification in radiation oncology. After a research fellowship at the Laboratory of Experimental Radiotherapy at KU Leuven, she obtained her PhD in medical sciences, for which she received the ESTRO-VARIAN Clinical Research Award in 1996. After this she spent four years as a staff member at The Netherlands Cancer Institute in Amsterdam.

Currently, Karin is Medical Director of the Proton Therapy of ParTICLe (Particle Therapy Interuniversity Centre Leuven) and full professor at KU Leuven. She specialises in gastrointestinal (GI) and genitourinary (GU) oncology and has a part-time appointment as a clinical research fellow at the Research Foundation Flanders. From 2006 to 2009, she was chair of the European Organisation for Research and Treatment of Cancer (EORTC) radiation oncology group, and from 2009 to 2015 she was chair of EORTC's quality assurance committee.

From 2009 until 2012, she served as treasurer of ESTRO. She is also heavily involved in the Belgian Cancer Registry as a member of the board and is chair of the coordination council.

In 2009 she was awarded the ESTRO Breur medal in recognition of her major contribution to European radiotherapy.

Since 2016 she has been clinical editor of *Radiotherapy & Oncology*.

Karin Haustermans has 235 peer-reviewed publications (h-index: 50).

Clinical committee new members

Peter Hoskin
Mount Vernon Hospital
London, UK

Esther Troost
TU Dresden Medical Faculty,
Carl Gustav Carus,
Dresden, Germany

Dorota Gabrys
Maria Sklodowska-Curie Memorial Cancer Centre & Institute of Oncology
Gliwice, Poland

Eric Deutsch
Institut Gustave Roussy
Villejuif, France

Maria-Antonietta Gambacorta
Università Cattolica del Sacro Cuore, Rome, Italy

Johannes A. Langendijk
UMCG University Medical Centre, Groningen,
The Netherlands

For more information on the clinical committee, visit: www.estro.org

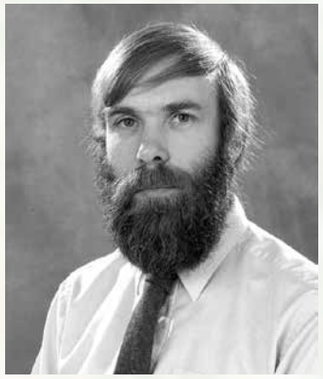
BRACHYTHERAPY

BRACHYTHERAPY

"We hope to see many of you at the sixth GEC-ESTRO workshop in Brussels, Belgium, at the end of November"

Welcome to the Brachytherapy Corner.

In this issue we are pleased to introduce our new Groupe Européen de Curiethérapie (GEC)-ESTRO committee chair-elect, Ina Jürgenliemk Schulz (MD, PhD), from Utrecht, The Netherlands. Ina has extensive experience within the field of brachytherapy and radiation therapy in general. In her interview, Ina emphasises that joint efforts to provide clinical evidence are vital to strengthen the position of brachytherapy in relation to other developing fields. Congratulations to Ina and best wishes for her term as chair-elect.



PETER HOSKIN

Frank-André Siebert (PhD) provides a detailed report from 'Braphyqs', the GEC-ESTRO physicists working group. Ongoing projects include European recommendations for quality assurance (QA) of ultrasound equipment, preparations for a survey on the use of *in vivo* dosimetry, recommendations on seed dosimetry and QA of conventional (that is TG43-based) treatment planning systems (TPS). The seed dosimetry project has been a successful collaboration between core members of Braphyqs, seed vendors and European-standard dosimetry laboratories. The project on QA of TPS is driven by collaboration between Braphyqs members and several other clinical physicists.

BRADLEY PIETERS

Last but not least, in the 'editors' pick' section we look at a physics paper describing dosimetry and the rationale behind the first commercially available, directional low-energy brachytherapy source.

We hope to see many of you at the sixth GEC-ESTRO workshop in Brussels, Belgium, at the end of November. The workshop starts in the evening of Thursday 29 November and continues through Friday 30 November. For more details, visit: www.estro.org/congresses-meetings/items/6th-gec-estro-workshop

Once again, this year, the working groups for anal-rectal, brachy-HERO, BRAPHYQS, breast, gynaecological, head-neck and skin, and UroGEC will have smaller satellite meetings, which will be held either before or after the workshop. If you wish to attend any of the working group meetings, email Evelyn Chimfwembe at echimfwembe@estro.org for more details.

ÅSA CARLSSON TEDGREN

Peter Hoskin, Bradley Pieters and Åsa Tedgren

Interview with Ina Jürgenliemk-Schulz, chair-elect of the Groupe Européen de Curiethérapie (GEC)-ESTRO committee

INA JÜRGENLIEMK SCHULZ

Congratulations on being elected the next chair of the GEC-ESTRO committee. How do you feel about it?

I am happy and excited to be elected by a large number of GEC-ESTRO members. It is a great honour and I want to express my gratitude once again, not only for being elected, but also for the positive feedback that I received from many people after the election results were announced.

Are you ready to take on the task of chair-elect?

Yes, I feel ready. I have years of experience with brachytherapy, mainly in relation to cervix cancer, but also for prostate cancer and other tumour sites. As a result, I feel confident that I will understand the professional challenges in different working groups and in brachytherapy more generally. Through the EMBRACE network and also outside of this, I have good contacts with many international colleagues working with brachytherapy. So I already have a good network for cooperation. I'm also going to be able to get more experience before taking on the role. I am very sure that with Bradley Pieters as the current chair, Christian Kirisits as past-chair and with the support of the GEC-ESTRO committee, I will be well prepared for taking on the role.

Tell us about your involvement in ESTRO, and particularly GEC-ESTRO?

Since 2005, I have actively participated in the GEC-ESTRO gynaecological working group, with a focus on the development and clinical implementation of image-guided and, especially, MRI-guided brachytherapy. This includes teaching and research activities. Through my work with the EMBRACE study group over the last few years I have gained experience in running multicentre international clinical trials. Since 2011, I have also taught on the ESTRO live and web-based gynaecological courses.

What do you enjoy most about your activities in GEC-ESTRO?

In comparison with other similar groups, GEC-ESTRO hosts a smaller community of healthcare providers. We can only treat a limited number of tumour anatomies and have to specialise. But there are a range of technological possibilities for improving our techniques. Given the sometimes limited numbers of patients that can be treated with brachytherapy, we have to work together and cooperate closely on improvement and collating evidence. Luckily, there are many colleagues within GEC-ESTRO, as well as outside the ▼

group, who want to work together. And we have industry partners that are willing to support our efforts. I really enjoy the lively discussions and interactions within GEC-ESTRO for the sake of clinical improvement.

How do you cope with balancing your activities in your department, GEC-ESTRO and with your family?

Family first! Luckily, my kids are not kids anymore, but young grown-ups busy with building their own lives, needing my time much less than they did. My husband also has his own busy professional life. So it is a matter of realising quality time for the family and not quantity time, which is currently working quite well for us. Balancing department and GEC-ESTRO activities might be more challenging. My daily clinical practice and the needs of my patients have priority, of course. Over the last few years I've been heavily involved in clinical implementation projects (MRI-guided brachytherapy and MR linac) but these are now finished or nearly finished. It's time for a new challenge.

Do you see any challenges for GEC-ESTRO in the future?

Yes, I see challenges: within brachytherapy itself, but also for brachytherapy in relation to other developing technologies. Within brachytherapy we are in a period of implementing image guidance into our treatment approaches. As part of this process we have to solve technological problems and needs. We also need to make image-guided brachytherapy more widely available around the world. So, on the one hand, we have to develop the high-tech side, and on the other hand we must transform this knowledge into lower-tech and/or lower-cost solutions.

In relation to other developing technologies, I think that we have to put effort into strengthening the position of brachytherapy. We cannot treat all tumour anatomies with brachytherapy, but where we can, we should put more effort into demonstrating that brachytherapy can be the treatment of choice. Therefore, efforts providing clinical evidence for the effectiveness of brachytherapy should be initiated and supported.

Do you foresee any challenges that could arise in your term as chair?

Yes, I certainly expect challenges to arise, but let's just wait to see which ones will have the highest priority at that point.

Are there any particular areas in GEC-ESTRO you would like to address?

Right now I have the impression that quite some effort will still be needed to strengthen the ties between GEC-ESTRO and the international brachytherapy associations. Secondly, increased interaction and cooperation of GEC-ESTRO with its industry partners is something which all working groups might benefit from.

What would you like to achieve by the end of your term?

This is a difficult question and to be honest I have no clear answer at the moment. It depends on the challenges that are left over after Bradley has finished his term. Right now, I would say that it would be satisfying to have improved the availability of high-quality brachytherapy globally.

Ina Jürgenliemk-Schulz, MD PhD
Radiation oncologist, biologist
Department of Radiation Oncology
University Medical Centre Utrecht,
The Netherlands
i.m.schulz@umcutrecht.nl

BIOGRAPHY

Ina Jürgenliemk-Schulz has been a radiation oncologist at the University Medical Centre Utrecht (UMCU), The Netherlands, since 1998. Before studying medicine, she studied biology, receiving an MSc in 1983. She received her medical degree in 1989 and her PhD in 1990. Ina started her residency in radiation oncology at the University Medical Centre in Bochum, Germany, and finished her training at UMCU. After her residency she took an internal fellowship in brachytherapy at UMCU, with a special focus on prostate and gynaecological cancer.

As well as her clinical obligations, Ina is focusing on her research in radiotherapy for gynaecological cancer, oligometastatic nodal disease of different pelvic tumours and motion management as detectable on repeated pelvic MRI. She is UMCU brachytherapy coordinator and was project leader for the clinical implementation of MRI-guided brachytherapy. She is currently leading the clinical implementation process for 1.5 T MR linac treatments at UMCU.

She is an active member of the Dutch Platform for Radiotherapy of Gynaecological Cancer and had a leading role in promoting and implementing MRI-guided adaptive brachytherapy and external beam radiation therapy (EBRT) in The Netherlands, including a Dutch quality assurance programme.

Since 2005 Ina has been an active member of the GEC-ESTRO gynaecological working group where she has research and teaching responsibilities. She has been an active member of the EMBRACE study group from the beginning and is national principal investigator for EMBRACE II. Since 2011, she has been a member of the teaching staff for the ESTRO course on 'Image-guided radiotherapy and chemotherapy in gynaecological cancer: focus on MRI-based adaptive brachytherapy'. Ina is course director and teacher for the ESTRO e-learning workshops on cervix cancer contouring for EBRT and brachytherapy.

Report from BRAPHYQS, a working group of GEC-ESTRO

BRAPHYQS core members at the UroGEC meeting at the University of Frankfurt, Germany, May 2018

FRANK-ANDRÉ SIEBERT

BRAPHYQS is the physics working group for Groupe Européen de Curiethérapie (GEC)-ESTRO, comprising a core group of 15 members, complemented by an international network of medical physicists who contribute to group projects. Over the years BRAPHYQS has completed various projects related to brachytherapy physics and quality assurance (QA). The following report is an overview of the main current BRAPHYQS projects.

Ultrasound plays an increasingly important role in modern brachytherapy. In particular, ultrasound imaging offers the possibility of real-time planning in low- and high-dose rate prostate implants. While these techniques have been incorporated into clinical practice several years ago, European QA guidelines for ultrasound use in brachytherapy are lacking. The BRAPHYQS group developed a QA programme for ultrasound devices for use in clinics and will publish these as recommendations. The recommendations mainly cover prostate techniques, as well as the use of ultrasound for anal cancer and gynaecological brachytherapy. The few commercially available ultrasound phantom models are described, along with requirements for measurements in a water tank. One chapter is dedicated to image quality, ▼

with several tests presented and examples given. The link between the ultrasound device and the brachytherapy treatment planning system is important. In this context, we outline QA issues such as scaling/volume checks and offset calibration for biplane ultrasound probes. We also cover prostate-specific tests, such as template calibration and movements of the stepping device in a further chapter. An example QA sheet for ultrasound in brachytherapy, including testing frequency and tolerances, is also included.

Recently there has been considerable research interest in *in vivo* dosimetry in brachytherapy. A BRAPHYQS work package in this area is chaired by Kari Tanderup. BRAPHYQS was involved in the organisation of several workshops, two dedicated to *in vivo* dosimetry and verification in brachytherapy alone, one in cooperation with the ESTRO physics committee (chair: Núria Jornet) at the first ESTRO physics workshop in Glasgow, UK, in November 2017. This workshop focused on *in vivo* methods for external and brachytherapy treatment techniques. A questionnaire is being prepared to evaluate the current status of and the need for *in vivo* dosimetry in a clinical setting. This survey will be sent out to different clinics and institutes and should give a good overview of the situation in hospitals.

Jose Perez-Calatayud chairs work package 18, which deals with dosimetry of low dose rate (LDR) sources (seeds) at the clinical level. The project team elaborated on guidelines about medical physicist actions and responsibilities regarding air kerma strength accuracy of LDR sources delivered to a clinic. They covered how many sources should be checked, how to interpret results, and what to do if the calibration exceeds the given limits. As well as being well organised and implemented, this project involved consultants from all the European seed vendors and European national standard laboratories offering services for low energy sources. This provided the opportunity to obtain valuable input to the preparation of a manuscript, and offered industrial partners insight of BRAPHYQS' project work.

Another important project launched last year, WP19, seeks to cover the lack of European guidelines on commissioning and QA for brachytherapy planning systems. A few years ago, the American Association of Physicists in Medicine (AAPM) and other partner societies published the TG-186 report (Beaulieu *et al.* 2012) on the commissioning of model-based-treatment planning systems. However, no European or American recommendations for conventional, TG-43-based planning systems have been published. BRAPHYQS initiated a relevant project led by Marisol De Brabandere and Alex Rijnders. A comprehensive overview on checks will be given to the end-user, not only for testing dose calculation, but also for other important issues like geometry and imaging, source and afterloader specification settings, applicator specification, and data transfer. The project group consists of several experienced physicists in brachytherapy from Europe, US, and Australia. This is the first 'open' project for BRAPHYQS', in which several expert medical physicists from outside the BRAPHYQS core group are contributing.

In addition, this year BRAPHYQS provided an update on a detailed review of fusion methods for brachytherapy applications. This review should eventually result in a comprehensive overview manuscript with expert opinions on the current state of the art, as this topic has already led to misunderstanding and inappropriate use of software solutions.

BRAPHYQS will be well represented at the upcoming GEC-ESTRO workshop in Brussels, Belgium in November, in which physicists are invited to meet group members and discuss topics in brachytherapy physics.

Frank-André Siebert
Chair of BRAPHYQS
Radiotherapy Clinic
UKSH, Kiel, Germany

Dosimetric characterisation of a new directional low-dose rate brachytherapy source

Aima M, DeWerd LA, Mitch MG, Hammer CG, Culberson WS

Med Phys. 2018 May 24. doi: 10.1002/mp.12994. [Epub ahead of print]

MANIK AIMA

What was your motivation for initiating this study?

The use of a directional source for low-dose rate (LDR) brachytherapy treatments can potentially lead to an improvement in the therapeutic ratio by selectively targeting malignant tissue in contrast to using conventional azimuthally-symmetric LDR sources. The CivaSheetTM is the first commercially available directional LDR brachytherapy device. Since the geometry and the design of the CivaSheet are considerably different from conventional LDR sources, a thorough investigation was required to ascertain the dosimetric characteristics of the device prior to its clinical implementation.

What were the main challenges of the work?

Up to this point, there were no primary traceable standards as well as dosimetric guidelines for a directional LDR brachytherapy source. Considering the directional and planar nature of the source, we needed to explore new measurement procedures and an adapted dosimetric framework. Custom phantoms and inserts were designed and fabricated to accommodate the unique source design for measurements. We also needed to investigate the impact of the gold shield on the source strength determination and dose distribution.

What are the most important findings of your study?

When comparing the CivaDot energy spectrum to a conventional Pd-103 source spectrum, we observed additional spectral peaks corresponding to the gold shield fluorescence. This low-energy fluorescence has a substantial impact on the CivaDot dosimetric measurements, especially the free-air chamber measurements. Air-kerma strength was deemed to be a feasible source strength metric for the CivaDot, based on primary measurements performed using two different free-air chambers with good repeatability and reproducibility. CivaDot dose-to-water measurements performed using thermoluminescent dosimeters and radiochromic film demonstrated good overall agreement with Monte Carlo-predicted dose distributions.

What are the implications of this research?

This work assisted in the establishment of a primary source strength standard for the directional CivaDot source in collaboration ▼

with the National Institute of Standards and Technology (NIST) in the USA. The work sought to add knowledge to brachytherapy dosimetry by presenting methods and procedures for the dosimetric characterisation of directional and planar LDR brachytherapy sources. The investigations performed in this work have facilitated the ongoing clinical implementation of the CivaSheet device.

Manik Aima, PhD, MSE
Department of Medical Physics
School of Medicine and Public Health
University of Wisconsin-Madison
Madison, USA

PHYSICS

INTRODUCTION

REVIEW OF THE AAPM 60TH ANNUAL MEETING

CARO-COMP-CAMRT JOINT SCIENTIFIC MEETING

PHD RESEARCH

PHYSICS

"Another obvious thread running through the reports of the conferences is the overlap of imaging physics and radiotherapy (RT) physics"

Welcome to the latest issue of the Physics Corner

In this issue we have reports from ESTRO representatives who attended the American Association of Physicists in Medicine (AAPM) meeting in Nashville, USA, in August and the joint meeting of the Canadian Association of Radiation Oncology (CARO), Canadian Organization of Medical Physicists (COMP) and Canadian Association of Medical Radiation Technologists (CAMRT) in Montreal, Canada, in September. Both reports show the strength of collaboration between ESTRO's physicists and other international groups, particularly through joint CARO-ESTRO and AAPM-ESTRO sessions.

Another obvious thread running through the reports of the conferences is the overlap of imaging physics and radiotherapy (RT) physics. There was a significant number of joint imaging / RT tracks at the AAPM meeting, while the joint CARO-ESTRO symposium in Montreal was on the topic of radiomics, a subject discussed by Claudio Fiorino in a very interesting article in this Corner.

The increased blending of imaging and radiotherapy physics is continued in our PhD research report, in which Patrick Wohlfahrt describes his work on dual energy CT (DECT) to determine accurate stopping powers for proton treatment planning. Of course, the use of DECT is also important for accurate tissue characterisation in photon dose calculation.

By the time you read this newsletter, the second ESTRO physics workshop, Science in development, in Malaga, Spain, will have happened. We hope those that attended had fruitful discussions. We look forward to reading reports on the workshop in the first newsletter of 2019.

We hope you enjoy reading the Physics Corner. As usual, we welcome any comments or suggestions for future articles.

Mischa Hoogeman (m.hoogeman@erasmusmc.nl)
Brendan McClean (Brendan.McClean@slh.ie)
Christian Richter (christian.richter@oncoray.de)

MISCHA HOOGEMAN

BRENDAN MCLEAN

CHRISTIAN RICHTER

PHYSICS

Review of the American Association of Physicists in Medicine (AAPM) 60th Annual Meeting

29 July to 2 August 2018
Nashville, Tennessee, USA

The 60th AAPM meeting was held in the city of Nashville, USA

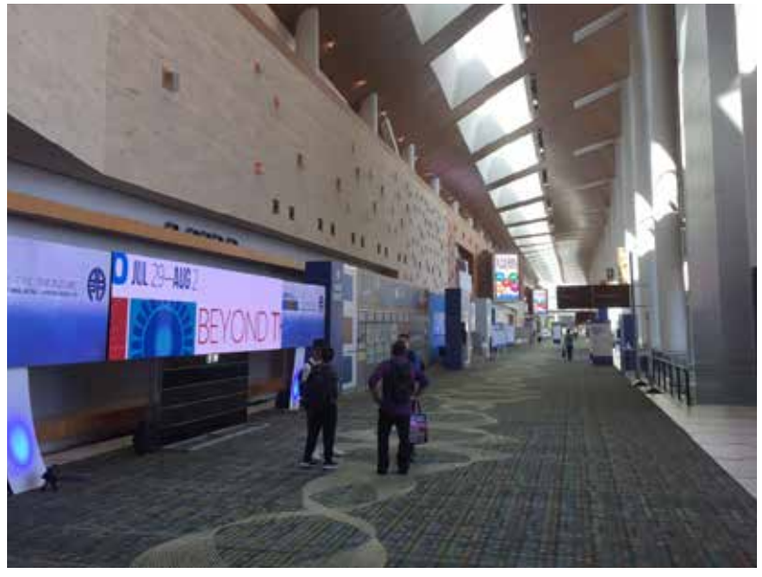
MOHAMMAD HUSSEIN

CHRISTIAN RØNN HANSEN

The 60th Annual Meeting of the American Association of Physicists in Medicine (AAPM) was held in the city of Nashville, Tennessee, USA, at the end of July and early August this year. Nashville is famously known as 'Music City' due its long history of American country music and vibrant seven-days-a-week music scene, which meant that every dinner was accompanied by high-quality live music. The conference was held in Nashville's huge convention centre, called the Music City Center.

The theme of the conference was 'Beyond the future!'; the aim being to think about how the field of medical physics can adapt to approaching changes, particularly around developments in areas such as automation, machine learning and artificial intelligence. The programme was packed with a mix of teaching lectures, symposia and proffered papers, as well as a large number of posters within the exhibition hall. At least half of the programme was dedicated to radiation oncology. However, the increasing importance of different specialisms working together within medical physics was recognised, with two of the eight tracks almost exclusively composed of joint radiotherapy physics and imaging physics sessions. These covered topics such as multimodality imaging, quantitative and functional imaging, imaging for particle therapy, and MR-guided radiotherapy.

The Music City Convention Center, where the 60th AAPM Annual Meeting was held



Inside the conference venue

Evening event on the terrace of the Music City Hall of Fame with a live band

There were various joint symposia, one of which was the joint AAPM-ESTRO symposium on automated treatment planning in clinical practice, chaired by the ESTRO physics committee chair, Núria Jornet. The symposium presented the achievements, limitations and future developments of four different solutions for automated planning. Representing ESTRO were Mohammad Hussein, Christian Hansen and Ben Heijmen, who spoke about their experiences with Varian RapidPlan, Pinnacle AutoPlan, and Erasmus iCycle respectively. Representing AAPM was Ke Sheng from the University of California, who discussed automated planning for 4pi treatment delivery.

A highlight of the conference was the organisation of the poster viewing sessions. All of the posters were placed within the exhibition hall, which meant they had good exposure. In addition, some of the highest scoring poster abstracts viewing sessions were scheduled around the coffee breaks, with various small islands of electronic poster screens strategically located around the exhibition hall, interspersed with the manufacturer stands (and quite close to the coffee stations!). Speakers would stand by their screen at the appropriate time to discuss their poster.

As well as the main conference, there were of course opportunities to explore Nashville's Lower Broadway as well as several fun social events, particularly the main social evening, which was held in the Country Music Hall of Fame with a live band on the rooftop terrace. It was a great opportunity to network with American colleagues and other international delegates.

We are both very grateful for the invitation from ESTRO and AAPM to attend the conference.

Mohammad Hussein
Metrology for Medical Physics Centre
National Physical Laboratory
Teddington, UK

Christian Rønn Hansen
Danish Centre for Particle Therapy, Aarhus
University Hospital, Aarhus
Laboratory of Radiation Physics, Odense
University Hospital, Odense
Institute of Clinical Research, University
of Southern Denmark, Odense
Denmark

CARO-COMP-CAMRT joint scientific meeting

12-15 September 2018
Montreal, Canada

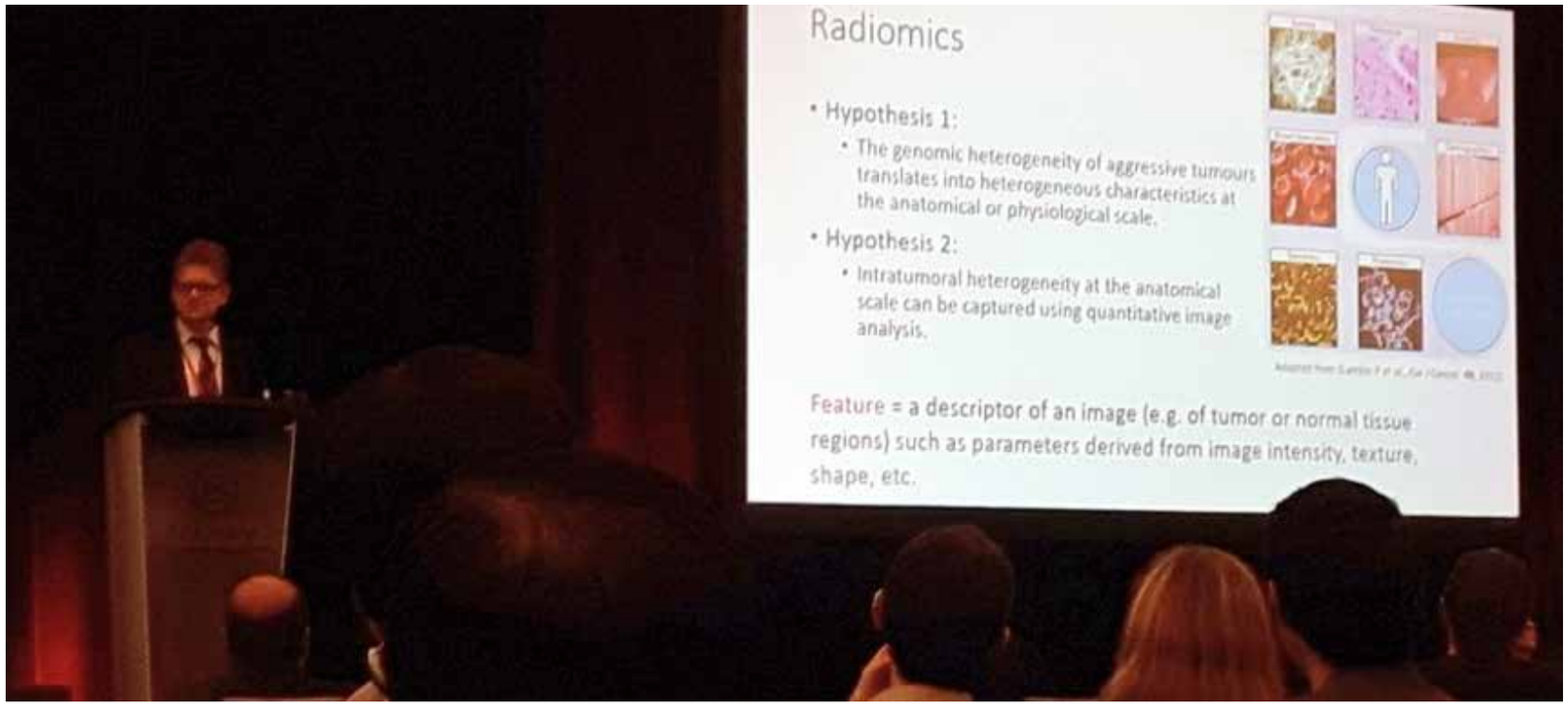
For four days in September, the Canadian city of Montreal was the location of a joint scientific conference organised by the Canadian Association of Radiation Oncology (CARO), the Canadian Organization of Medical Physicists (COMP) and the Canadian Association of Medical Radiation Technologists (CAMRT). Every five years the three organisations come together to deliver a joint conference that facilitates networking, discussion and the presentation of the latest research being undertaken in Canada. The interdisciplinary setting – familiar to anyone who has attended the ESTRO annual conference – provides a forum for lively discussion between the physicists, radiation oncologists and radiation therapists (RTTs) attending, who this year numbered nearly 700.

Presentations and discussion on the use of particle and proton therapy in Canada started with the physics perspective, with a presentation from Professor Thomas Bortfeld, from Massachusetts General Hospital, Boston, USA. The next day Professor Thomas DeLaney, from Massachusetts General Hospital, Boston, USA, offered the clinical rationale. There is renewed interest in proton therapy in Canada, making this a timely discussion.

As well as keynote lectures from award winners in different disciplines, including Laura Dawson, from Princess Margaret Cancer Centre, Toronto, Canada; Luc Beaulieu, from Laval University, Québec, Canada and Anna Cellar, from University of British Columbia, Vancouver, Canada. There was also time for poster viewing and informal networking. In addition, the meeting explored several emerging topics in radiation oncology, including machine learning and deep-learning techniques. Participants heard how researchers are currently investigating the use of these techniques for prioritising multidisciplinary peer-review rounds, making synthetic CTs out of MR imaging for MR-only workflows. In addition, machine learning techniques are being used for automatic planning and for predicting at an early stage the likelihood of patients needing adaptive radiotherapy.

The final session of the conference was a joint CARO-ESTRO symposium, which this year focused on radiomics. Dr Wouter van Elmpt, from Maastricht, The Netherlands, opened the symposium with an introduction to radiomics, highlighting some of the seminal papers in the field, including 'Radiomics: extracting more information from medical images using advanced ▼

WOUTER VAN ELMPT



Prof Seuntjens giving his lecture during the CARO-ESTRO symposium

feature analysis' by Lambin *et al*, EJC 2012, and 'Decoding tumour phenotype by non-invasive imaging using a quantitative radiomics approach' by Aerts *et al*, Nature Communications 2014. Recent ongoing work by various groups in Europe was also presented, including work by the Gustave Roussy group in France looking into the combination of radiomics and immunotherapy (Sun *et al*, Lancet Oncol 2018).

After this, Dr Benjamin Haibe-Kains, from the Princess Margaret Cancer Centre, Toronto, put this current work in context highlighting what can be achieved with today's open-source software (e.g. Py-Radiomics) and linking this back to past genomics work and techniques. During the panel discussion, Dr Haibe-Kains explained that we are entering a new era with deep learning techniques used for advanced image analysis. Finally, Professor Jan Seuntjens, from McGill University, Montreal, discussed some of the pitfalls and opportunities for radiomics. Participants contributed to the lively panel discussion, which brought the meeting to a close.

Wouter van Elmpt
Physics committee member
Maastricht University Medical Centre
Maastricht, The Netherlands

PHYSICS

PHD RESEARCH

Dual-energy computed tomography for accurate stopping-power prediction in proton treatment planning

Interview with the author, Patrick Wohlfahrt

PATRICK WOHLFAHRT

What was your motivation for choosing this PhD topic?

Particle therapy is promising to be the treatment of choice for most static and localised tumours due to the defined particle range. However, uncertainties in treatment planning, specifically in particle range prediction from X-ray computed tomography (CT), results in the irradiation of additional margins encompassing healthy tissue around the tumour. To improve range prediction, the acquisition of two CT scans with different X-ray spectra, referred to as dual-energy computed tomography (DECT), was suggested for proton therapy, but had not been clinically applied. For my PhD, we aimed to assess the accuracy and clinical relevance of DECT-based range calculation, and look at ways to translate DECT into routine clinical practice.

What are the main findings of your PhD?

First, a DECT scan protocol appropriate for radiotherapy applications was developed allowing for quantitative CT scans with high CT number constancy concerning variations in patient size. Subsequently, the reliability and superior accuracy of direct DECT-based stopping-power prediction (DirectSPR) as an alternative to the current state-of-the-art application of a heuristic conversion from CT numbers to stopping-power ratio (SPR) using a Hounsfield look-up table (HLUT) were validated under clinical conditions in an anthropomorphic head phantom and in biological tissue samples, and finally transferred to relative range shifts obtained in patients (Fig.1). ▼

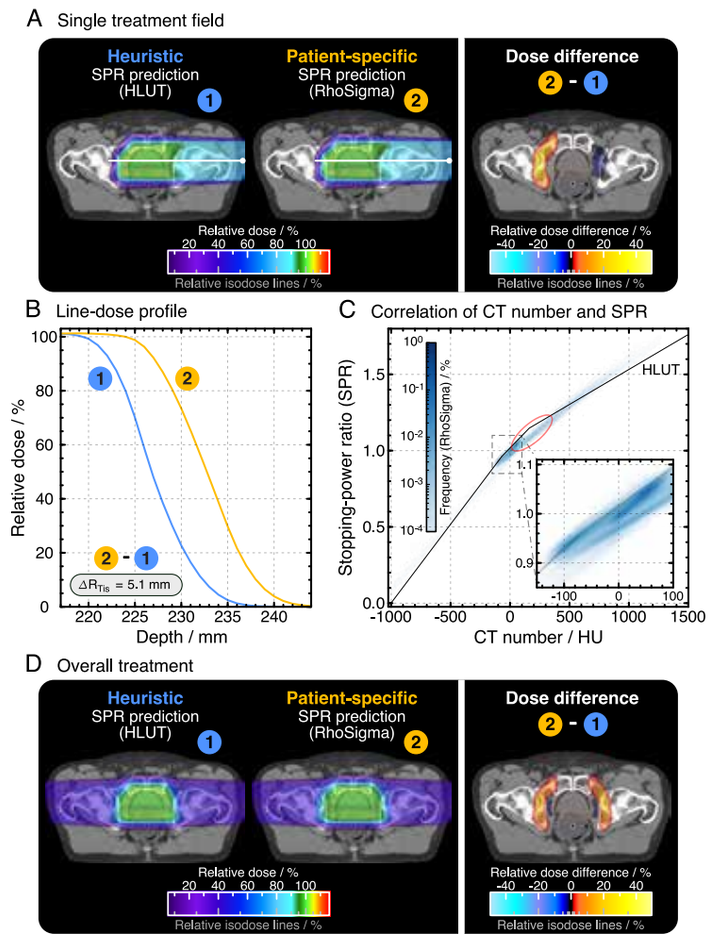


Fig. 1: Proton treatment plan of a 73-year-old patient with prostate cancer calculated using an HLUT (1) and a direct DECT-based patient-specific SPR prediction method (2) for CT-number-to-SPR conversion. The red ellipse indicates muscle and trabecular bone, which mainly cause the considerable range shifts in prostate-cancer patients between both methods. Adapted from [1].

[1] Wohlfahrt P, Möhler C, Stützer K, Greilich S, and Richter C. 2017c. Dual-energy CT-based proton range prediction in head and pelvic tumour patients. *Radiotherapy & Oncology* 125:526–533. DOI: 10.1016/j.radonc.2017.09.042.

Systematic range shifts between the HLUT and DirectSPR approach were retrospectively assessed in patients with cerebral, pelvic or thoracic tumours ranging from 1.2% (brain) to 2.3% (lung) of total range on average. Based on patient DECT scans, the clinical HLUT was refined leading to a significant reduction of range deviations between both methods and an increased SPR accuracy in patients (Fig.2).

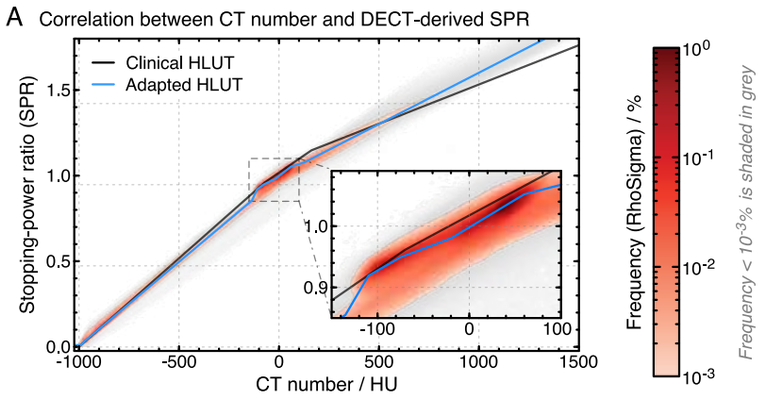


Fig. 2: (A) Frequency distribution of voxelwise correlations between CT number and DECT-derived SPR as well as the respective HLUTs before and after HLUT refinement based on DECT information. (B) Distribution of range shifts between the DECT-based DirectSPR approach and HLUT before and after HLUT refinement (Gaussian distribution was fitted to the data).

What is the impact of your work on the field?

Based on the results of my PhD, it can be concluded that DECT is clinically applicable in radiotherapy and allows for an accurate, safe and reliable prediction of electron density and proton stopping power, which is required for treatment planning in photon and proton therapy, respectively. The improved accuracy and robustness of DECT-based SPR prediction might facilitate a reduction of clinically applied margins accounting for the CT-related range uncertainty. This represents an important step to optimise treatment delivery in proton therapy and can eventually contribute to a better sparing of healthy tissue.

Due to the close collaboration between research institutions, particle therapy facilities and industrial partners, we could improve the clinical usability of DECT and develop a strategy for a safe clinical implementation of DECT for treatment planning. This could easily be adopted by other facilities allowing for further improved care and comparability of patient treatments between centres.

What was the most challenging part of your PhD?

The most challenging part was the preparation of the routine clinical application of DECT for proton treatment planning (training of radiation therapists [RTTs], development of quality assurance tools, specification of clinical tolerance levels, conducting a safety check and end-to-end test etc) and the early stage after clinical implementation (optimisation of clinical workflow, improvement of DECT scan protocols, handling of clinical limitations etc). However, the many hours of clinical work in addition to the research questions were worth it. I expanded my personal horizons and benefitted from the extensive clinical experience.

Who or what inspired you most during your studies?

I was really inspired by the interdisciplinary working atmosphere in my department, which included physicians, clinical medical physicists, RTTs and researchers. The open-minded and in-depth discussions that we had about different aspects of cases, the challenges and requirements really helped to translate dual-energy CT into treatment planning. It was thanks to this close cooperation, outstanding teamwork and pleasant atmosphere that we were able to realise the entire project.

Will you stay in the field? What are your plans for the future?

Yes, I want to keep on doing research in this exciting field. Next year I am going to take up a postdoctoral position at the Massachusetts ▼

General Hospital and Harvard Medical School (Boston, USA), where I will continue working on improving imaging techniques for various radiotherapeutic applications.

Which institution were you affiliated to during your PhD?

I was affiliated to OncoRay – National Centre for Radiation Research in Oncology (Dresden, Germany) – and the Institute of Radiooncology within the Helmholtz-Zentrum Dresden-Rossendorf, (Dresden, Germany). In addition, my PhD project was carried out as part of a joint project between OncoRay and the German Cancer Research Centre (Heidelberg, Germany) within the National Centre for Radiation Research in Oncology (NCRO) in Germany.

Where are you currently working?

I am still working as a postdoctoral research fellow at OncoRay until the end of this year. I am part of an interdisciplinary team of physicians, medical physicists and RTTs and support the full clinical translation of dual-energy CT into proton treatment planning.

When did you defend your thesis?

I successfully defended my PhD thesis in August 2018 after two independent positive expert statements written by Professors Drs Wolfgang Enghardt (Dresden, Germany) and Anthony Lomax (Zurich, Switzerland) and an oral public defence headed by Professor Dr Esther Troost (Dresden, Germany).

Who were your supervisors?

Professor Dr Wolfgang Enghardt and Dr Christian Richter supervised me. I especially valued their expert advice on the theoretical and practical aspects of my thesis, their unlimited support and helpfulness, as well as the many hours of scientific discussions that we had.

Patrick Wohlfahrt
OncoRay
Dresden, Germany

New series on PhD research in the Physics Corner

Have you just completed or are you about to complete an interesting PhD thesis? Then please share it with the ESTRO physics community by contacting Christian at christian.richter@oncoray.de for more details. If your report is accepted by the editors of the Physics Corner, it will be published in a forthcoming issue of the newsletter.

ABSTRACT

Range uncertainty in proton therapy currently hampers the full exploitation of its physical advantages. A substantial amount of this uncertainty arises from proton range prediction based on X-ray computed tomography (CT).

Dual-energy CT (DECT) has often been suggested as a promising imaging modality to reduce this CT-related range uncertainty. Within this thesis, the translation of DECT into application in proton therapy was evaluated.

First, a CT scan protocol was optimised for radiotherapy considering the image quality and CT number stability for various body regions and sizes. The patient-specific DECT-based range prediction was then calibrated and its accuracy validated in two ground-truth experiments using an anthropomorphic phantom and homogeneous biological tissues. Subsequently, the clinical relevance of DECT was demonstrated in a retrospective cohort analysis of cerebral, pelvic and thoracic tumour patients. The systematic range deviations between the DECT and state-of-the-art approach were then reduced by adapting the standard method utilising additional patient information obtained from DECT. Hence, DECT was clinically applied for the first time to refine proton range calculation. As a further step, the use of patient-specific DECT-based range prediction also considers intra- and inter-patient tissue variabilities as quantified in brain-tumour patients.

Future implementation will be an important cornerstone to improve proton range calculation and might open up the possibility to reduce clinical safety margins accounting for the CT-related range uncertainty.

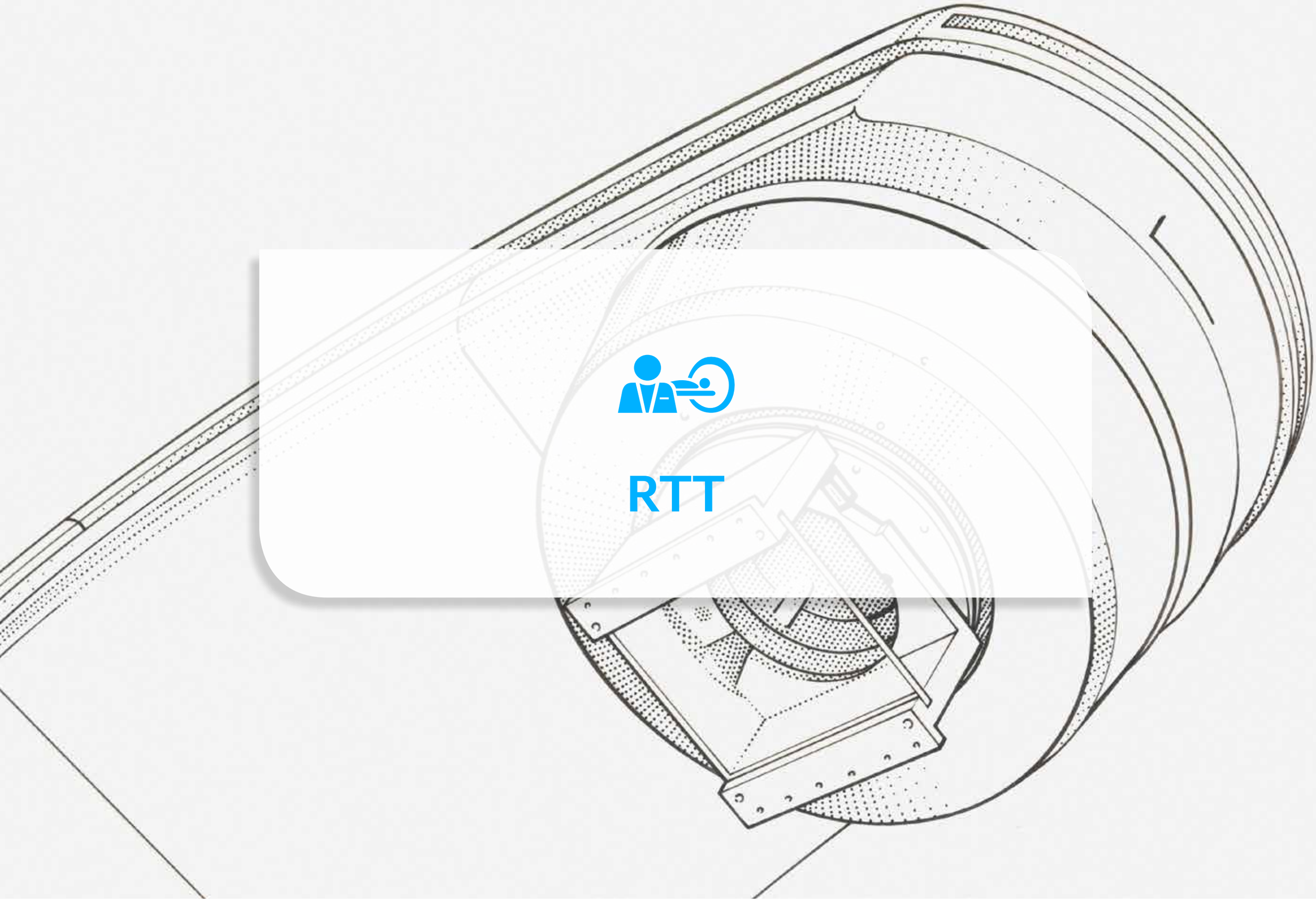
The full report of the PhD thesis is available: tud.qucosa.de/landing-page/?tx_dlf[id]=http%3A%2F%2Ftud.qucosa.de%2Fapi%2Fqucosa%253A31755%2Fmets >

BIOGRAPHY

Patrick Wohlfahrt is currently a postdoctoral research fellow at OncoRay (Dresden, Germany) working on the translation of dual-energy CT into applied particle therapy. In 2009, he began his undergraduate studies in medical physics at the Martin Luther University Halle-Wittenberg (Halle (Saale), Germany). During this time, he spent three months as a research fellow at the University of Calgary (Calgary, Canada) and performed automatic cross correlation and network dynamic analyses to detect sleep dependent / independent pathologies and identify sleep stages in real time. After becoming interested in the scientific evaluation of clinical data, Patrick decided to develop an automatic sleep / wake differentiation algorithm based on accelerometric data of humans recorded in the German long-term population study NAKO as part of his bachelor's thesis.

After graduating with a BSc in 2012, Patrick moved to Dresden, where he studied medical radiation sciences at the TU Dresden (Dresden, Germany), becoming a certified medical physicist in radiation oncology, nuclear medicine and radiology. While being trained as clinical medical physicist, he was thrilled by the use and continuous improvement of imaging techniques, such as computed tomography (CT), magnetic resonance imaging, positron-emission tomography and single-photon emission CT. In his master's thesis, he focused on the influence of CT imaging on proton range prediction in the early stages of commissioning the proton therapy facility in Dresden.

After obtaining his master's degree (MSc) in 2014, Patrick started a PhD project at OncoRay in close collaboration with the German Cancer Research Centre (Heidelberg, Germany) to further improve range prediction in particle therapy using dual-energy CT (DECT). He received the Young Investigator Award of the German Society of Medical Physics in 2016 and the first Behnken-Berger Award in 2018. He successfully defended his PhD thesis in August 2018.



RTT

RTT

"This edition of the Corner features contributions from radiation therapists (RTTs) who have played key roles in changing practice"

Welcome to the RTT Corner.

It feels appropriate that this edition of the Corner features contributions from radiation therapists (RTTs) who have played key roles in changing practice.

First, it is a great pleasure to read about the career development of Anita Donovan, who is working in an academic post at Trinity College Dublin, Ireland. Anita's interest and experience in geriatric oncology is described in her piece, which we are sure will make us reflect on how we treat ageing cancer patients. Anita conveys the message that our roles as RTTs are diverse, and evolve to suit the needs of society, while working within multidisciplinary teams. For those interested in developing such roles, Anita describes her career pathway and the educational aspects of this.

Isabel has invited her colleague Margarida Rato to discuss their experience of implementing deep inspiration breath-hold (DIBH) for breast cancer patients at Mercurius Health, Portugal. Although evidence has recommended the use of DIBH for a number of years, departments still face resource constraints that prevent these developments from being incorporated into routine practice. In her piece, Margarida tells us how clinical staff overcame departmental challenges and made a positive change.

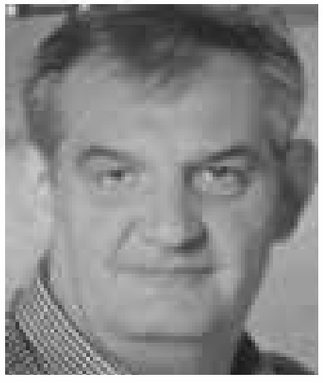
Finally, Velimir Karadza reflects on the past ten years of RTT experience in Croatia and practice development following participation in ESTRO's 'train the trainer' programme. Velimir outlines the successful changes that have been implemented in Croatia to improve the education of RTTs and how this has led to a higher profile for the profession. The progress made in the last decade in Croatia will be further enhanced by a new team attending a forthcoming 'train the trainer' course.

We hope you enjoy this edition.

Aileen Duffton (aileen.duffton@ggc.scot.nhs.uk)
Isabel Lobato (isabelloba@gmail.com)
Ilija Čurić (iccurici@gmail.com)

AILEEN DUFFTON

ISABEL LOBATO



ILIJA ČURIĆ

RTT

Oncology of later life – new horizons for the radiation therapist (RTT)

ANITA O'DONOVAN

My early career

After graduating from Trinity College Dublin's (TCD) radiation therapy undergraduate degree programme in 2002, I worked in both clinical and research positions in Ireland, before returning to academia ten years later. Much of my research focus during this period was with prostate cancer patients, supporting them through their radiotherapy treatment. This naturally led to the transition to an advanced practice role in the radiation therapist (RTT)-led prostate cancer review clinics that were delivered in a centre that I worked in. Having undertaken MSc-level training and a period of mentorship, I was able to work in the RTT-led prostate cancer review clinics on a weekly basis. I found this to be a very rewarding experience, and it stimulated my interest in older patients generally. I often felt that there were additional problems that we weren't able to fully resolve for these patients, or even fully appreciate. There also seemed to be poor integration of care with other disciplines, such as geriatric medicine and community-based services, which I felt could be better exploited to develop a more holistic approach for these patients.

Transition back to academia

When I joined the discipline of radiation therapy in TCD in 2011, as assistant professor, I immediately began thinking about my MSc/PhD topic. At the time, the discipline of medical gerontology was very proactive in providing lectures and courses for other disciplines within the university. This immediately sparked my interest, as I could see that many of our patients had overlapping health concerns, which our colleagues in geriatric medicine dealt with. I was very fortunate to have had this opportunity to learn from experts in the field of medical gerontology, which broadened my perspective and promoted the integration of this knowledge into the RTT setting. It also impressed upon me the importance of preparing for a rapidly ageing population, a concern for us in Ireland, but also internationally, as the so-called 'baby boomers' come of age.

I was immediately drawn to the emerging discipline of geriatric oncology internationally. Ironically, given that the majority of our patients are older, this was a small niche group of like-minded people who felt we could do more for our older cancer patients. I joined the TCD ageing steering committee, led by TCD's Professor Rose Anne Kenny, representing the theme ▼

'cancer and ageing'. One of the main aims of this research centre was to optimise opportunities for collaborative research between different disciplines. Fortunately, ageing research is a main focus of TCD's strategic plan, and is one of the major themes prioritised by the College, as well as my own discipline of radiation therapy, as part of our health services research strand.

Building an international network

I contacted a group from the International Society of Geriatric Oncology (SIOG) and became a national representative in Ireland for that organisation, and also served as a member of the board and executive committee. This allowed me to make some valuable contacts within the very welcoming geriatric oncology academic community. I was fortunate during that time to be supported by my department to travel to the University of Rochester, USA, and spend time in a dedicated geriatric oncology clinic, with Dr Supriya Mohile, an international leader in the field, who gave very generously of her time and was very supportive of my research ideas. Shortly after that, I conducted an international Delphi consensus study on the practicalities of geriatric assessment in oncology, from a European perspective, followed by another collaboration with Dr Mohile, from a US perspective.

This formed the first phase of a broader PhD topic on geriatric assessment and the application of these measures in clinical practice.

Applications to future RTT education

Subsequently, I developed a keen interest in older patient advocacy, incorporating these principles into my teaching on both the undergraduate and postgraduate programme for radiation therapy. Previous research has highlighted the importance of education in promoting inter-generational solidarity and the adoption of positive attitudes towards older people for future healthcare professionals. This is very important in creating a culture of caring for older adults, and a more holistic approach towards the aged patient, rather than solely focusing on cancer as a disease.

The importance of RTT role development in geriatric oncology

I know from attending various conferences and courses over the years, that some centres have already implemented roles such as dementia champions and RTTs specialised in geriatric oncology. The Society and College of Radiographers in the UK have developed guidelines for the treatment of patients with dementia, a further example of responding to the needs of our profession, as we will undoubtedly see more of these patients. Much of the current radiation therapy research is focused on more flexible radiotherapy regimes, incorporating hypofractionation, which may be an especially attractive option, if travel to radiotherapy poses too much of a challenge for our older patients. I think these approaches show remarkable innovation; however, there is a need for more progress in this field of geriatric oncology in radiotherapy. As autonomous professionals, there are great opportunities for role development for RTTs in this area.

As RTTs, we really value evidence-based practice in all aspects of our profession. However, it is well known that older adults are under-represented in clinical trials, a fact that has greatly reduced the evidence base for their care. We know from clinical practice that ageing is a very heterogeneous process, and that there is no one-size-fits-all in this patient age group, especially in vulnerable or frail patients, as opposed to fitter patients, who may be treated like their younger counterparts. There are large knowledge gaps in radiation oncology in particular, where more research is needed. As RTTs, we have a responsibility to conduct research that will inform our practice and provide a more evidence-based perspective.

As in other aspects of clinical practice where we have learned from our colleagues in other disciplines, there is a great need to develop education programmes that will allow us as a profession to gain a greater understanding of the complexities of ageing. We need to be more responsive to the needs of our older patients. This is an investment in our own future, as well as the future of our profession. ▼

Conclusion

I am heartened by the great progress that I have seen over the years since I first became interested in the field of geriatric oncology. There are great opportunities for RTTs to do much more in response to the complex needs of our older patients, and to provide a better evidence base for clinical practice. My career trajectory has naturally led me to have an interest in this field, and I am now in the final stages of my PhD, looking at data from The Irish LongituDinal study of Ageing (TILDA), with regard to survivorship concerns of older cancer patients. I am still actively involved with SIOG as a member of their science and education committee, a reviewer for their journal (*Journal of Geriatric Oncology*), as well as a faculty member for the advanced course on geriatric oncology. I have been a member of the organising committee for Ireland's annual national geriatric oncology meeting, since its inception four years ago. In October, I'm delighted to participate as a faculty member on the new ESTRO course on the 'Multidisciplinary management of non-melanoma skin cancer', incorporating some lectures on geriatric oncology. It is a rewarding experience to pass on what I have learned to the next generation of RTTs through our undergraduate and postgraduate programme here at TCD. I continue to learn from colleagues in medical gerontology and try to apply that learning to RTT practice. Small changes can make a big difference, and education is key to improving practice. There is much opportunity for better interdisciplinary collaboration. I would encourage all RTTs to think about their current setting and institution, and how they can develop their practice to be more mindful of the needs of older patients.

Finally, I would like to express my gratitude to the previous Head of Radiation Therapy at TCD, Mary Coffey, and the current Head, Michelle Leech, who have both been especially supportive of my non-traditional career trajectory in this field, and facilitated all of the opportunities mentioned above.

Anita O'Donovan
Assistant professor, radiation therapy
Trinity College Dublin
Ireland

RTT

A small change, a great change: implementing deep inspiration breath-hold for breast cancer patients

MARGARIDA RATO

Breast cancer accounts for 25% of female cancer cases, with an estimated 1.7 million cases diagnosed in 2012. We know that radiotherapy reduces breast cancer recurrence and mortality. As Taylor C *et al.* (2018) said, "Because most women with early breast cancer are cured of their disease, the issue of survivorship is important."

We also know that systemic therapies can cause cardiac side effects. Darby SC *et al.* (2013) reported that the risk of major coronary events increases by 7.4% per gray in mean heart dose. With our patients living longer, we must attempt to administer lower doses to the cardiac structures, aiming to reduce late toxicity.

One technique that enables us to achieve this is deep inspiration breath hold (DIBH). By expanding the lungs, DIBH increases the distance between the target volume and cardiac structures, which allows us to achieve a lower cardiac and pulmonary toxicity, without compromising the coverage of the target volume.

In our department we've challenged ourselves to implement DIBH with our available resources. We already had Real-Time Position Management™ (RPM™) in one of our treatment rooms, so the only cost came with the purchase of video goggles to enhance patient participation.

The DIBH technique requires patient collaboration. Therefore, patients are selected according to predefined criteria. For example, the patient must be able to perform thoracic respiration instead of abdominal respiration. We also exclude patients with respiratory comorbidities.

Before the CT scan we have a short training session with the patient. We explain the procedure and we ask the patient to perform three cycles of 20 seconds in DIBH, and we set the respiratory range for RPM™. The literature says that audio-visual feedback enhances DIBH reproducibility and stability, so while we acquire the CT planning the patient receives audio guidance and observes her respiratory movements.

During the treatment sessions, RPM™ allows us to reproduce the required inspiratory level in a viable, stable and accurate way. With audio-visual feedback the patient can control her respiratory movements, which improves DIBH reproducibility and stability. ▼

We have observed a minor impact on the department's workflow (for example, free breathing treatment takes 12 minutes on average, versus 20 minutes for DIBH treatment).

In our department we believe that this small change in our clinical practice, can make a great difference to patient outcomes.

Margarida Rato
Mercurius Health, S.A.
Hospital Espírito Santo Évora E.P.E - radiotherapy department
Portugal

REFERENCES

[1] Torre, LA *et al.* Global Cancer Statistics, 2012. *CA CANCER J CLIN* 2015; 65:87–108

[2] Taylor C *et al.* Estimating the risks of breast cancer radiotherapy: evidence from modern radiation doses to the lungs and heart and from previous randomized trials. *J Clin Oncol* 2017; 35: 1641-1649

[3] Zaher, E *et al.* Assessment of the onset of radiation-induced cardiac damage after radiotherapy of breast cancer patients. *Alex J Med* 2018

[4] Darby, SC *et al.* Risk of ischemic heart disease in women after radiotherapy for breast cancer. *N Engl J Med* 2013; 368: 987-98

[5] Nissen, HD, Appelt AL. Improved heart, lung and target dose with deep inspiration breath hold in a large clinical series of breast cancer patients. *Radiother Oncol* 2013; 106: 28 – 32.

[6] Latty, D *et al.* Review of deep inspiration breath-hold techniques for the treatment of breast cancer. *J Med Radiat Sci* 2015; 62 (1): 74–81

[7] Bartlett, FR *et al.* Voluntary breath-hold technique for reducing heart dose in left breast radiotherapy. *J Vis Exp* 2014; (89): 51578.

[8] Nien, H *et al.* Rice, L. *et al.* Complicated respiratory motion analysis and new CT-based instruction model to enhance deep inspiration breath hold technique. *Ther Radiol Oncol* 2018; 2:2

RTT

10th anniversary of Croatia's involvement in the RTT 'train the trainer' programme

VELIMIR KARADZA

Train the trainer course in Split, Croatia 2011

Quality assurance workshop - 4th course

This year, Croatia is preparing a new team of three radiation therapists (RTTs) to attend the ESTRO course: 'Best practice in radiation oncology: a workshop to train RTT trainers'.

We are doing this exactly ten years on from the first 'train the trainer' course that Croatia participated in. This tenth anniversary is a good opportunity to look back and reflect on our involvement in the 'train the trainer' programme.

When the first team from Croatia went to Vienna, Austria, to attend that first course, it was in many ways the starting point for them, as well as the RTT community back home. RTTs in Croatia had a poor professional status, with a lack of formal education, no continuing professional development (CPD), no council or chamber to be part of, and practically no recognition as health workers.

It was hard to know where to start, but as the old saying goes, 'where there is a will, there is a way'. And the way for these three RTTs started with the help of our national society (HDIMR) and, later on, the State Office for Radiological and Nuclear Safety.

Two successful training courses where delivered in 2009, and in 2010, the Croatian Chamber of Health Professionals was established and gave its support. During 2009 and 2010, the University of Applied Health Sciences in Zagreb and the University Department of Health Studies, ▼

Laboratory presentation - 3rd course

Mary Coffey, the first train the trainer attendees from Serbia, Croatia and Bosnia, and the SEETRO founders
(right from left –Ilija Curic, J. Stevanovic, Mary Coffey, Velimir Karadza, A. Kostovski, M. Gašparovic, Melisa Jacevic, D. Cipric, M. Jacevic)

University of Split, also gave their support. This was followed by two very successful courses / workshops that actually outgrew their initial purpose as small local courses.

A particularly positive development that followed this process was the interlinking between different countries that participated in the ESTRO 'train the trainer' workshop. This collaboration gave strength and courage to participants in these countries to progress, offering support and attending each other's courses and events over the years. This collaboration is what eventually led to the formation of the South East Europe Technology in Radiation Oncology (SEETRO) international congresses.

Through the 'train the trainer' project, Croatia has successfully developed seven courses / workshops, two symposia and one congress. Cooperation was established with both the national educational bodies and state authorities to recognise the profession of radiation therapy. The lack of formal education has been highlighted and a new education programme has been announced by university authorities. We have created a book of competencies for RTTs, and we are looking at defining the standards of qualification and CPD for our profession.

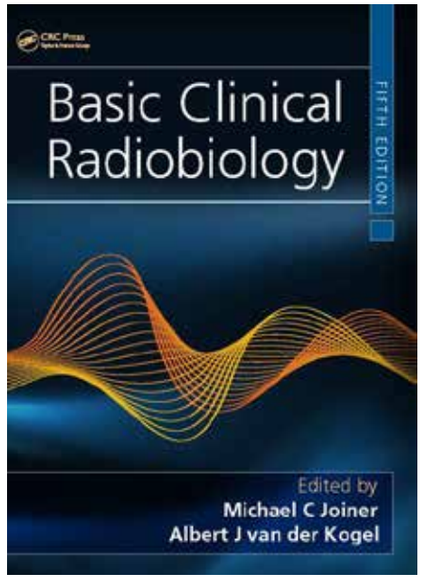
It has been a really exciting decade for us, and we decided to celebrate it with the new team that applied for the forthcoming ESTRO 'train the trainer' course. We hope that they will continue this important work in Croatia with the same enthusiasm as their predecessors.

Velimir Karadza, MSc, RTT
Head of Radiotherapy Unit
Clinic of Oncology
University Hospital Centre Zagreb
Zagreb, Croatia
vkaradza@kbc-zagreb.hr

RADIOBIOLOGY

New fifth edition of ‘Basic clinical radiobiology’

ROB COPPES



In September 2018 the new long-expected fifth edition of ‘Basic clinical radiobiology’, edited by Mike Joiner and Bert van der Kogel, was published. This basic handbook is world-famous and has introduced generations of radiation oncologists, biologists and physicists to clinical radiobiology.

Since the first edition, edited by Gordon Steel 25 years ago, this book has been used for the teaching course of the same name organised by ESTRO of which one of the current editors, Mike Joiner, is the current course director. Therefore, I interviewed the editors on different occasions; Bert van der Kogel at the workshop ‘Current challenges of patient re-irradiation’ in Stockholm on 6 September, and Mike Joiner at the above-mentioned course in Dublin on 18 September. This is a combined summary of those interviews.

Why did it take nine years to get to the next edition? Well, both editors agreed that it has been a lengthy process because never before have so many authors, old and new, contributed to the book, which made it more difficult to handle. However, the result is fantastic. The content is much more homogeneous, the layout improved and the cover nicely illustrates the developments of radiation oncology since the first edition going from 2D via 3D to now more 4D treatments. And the size has increased. Almost all chapters have been updated and several new chapters have been added.

Chapters on hypoxia, with new authors such as Martin Brown, have undergone considerable changes, particularly the clinically-orientated chapter by Michael Horsman et al, which has been greatly expanded. Both Mike and Bert are proud of the new chapters on ‘Stem cells in radiotherapy’ and ‘Tissue response models’, and Mike is especially pleased and happy with the new chapter on ‘Physics of radiation therapy for the radiobiologist’ by Jay Burmeister and himself.

Nonetheless, the more established subjects of dose responses and fractionation with the linear quadratic (LQ) model, time factors and dose-rate effects, volume effects and retreatment tolerance, tumour radiobiology, combined modality therapy, linear energy transfer (LET), relative biological effectiveness (RBE), the oxygen effect, the pathogenesis of normal tissue side effects and radiotherapy-induced secondary cancers are still covered in depth. Information on image-guided radiotherapy, biological response modifiers, ▼

the tumour microenvironment, the molecular description of DNA damage response, cell death, molecular targeting and individualisation provides a very nice overview of important topics in the field. So, all in all, both editors agree that they are very satisfied and proud of this new edition.

On the question whether they are going to edit the next edition as well, Bert van der Kogel replied “no, this was the last one”. However, Mike Joiner hesitated and said he might be willing to edit the next version. Except this may not be needed as the publisher CRC Press may launch another concept whereby book chapters will be updated and added as online versions of the book when ready. This would allow the rapid inclusion of new developments and topics, such as combined immunotherapy and radiotherapy, MR-linac and developments in proton therapy. Therefore, the editing may become a continuous process in the future.

Finally, I must admit that the book has kept up with time. Illustrations have all been updated and very much improved making it a pleasure to read, although it is now heavier to carry around. For this there is also an online version of the book now, that can be downloaded and read on computer, tablet or phone and which is of real additional value and not so heavy!

It was a pleasure to interview these friends who have put so much effort into this book, and have, for many years past and hopefully many years to come, made sure that the education of radiation clinicians, physicists and biologists is up-to-date, allowing progress in the field of science and application from the basics.

From left to right: Albert J. van der Kogel and Michael C. Joiner, editors of the fifth edition of ‘Basic clinical radiobiology’

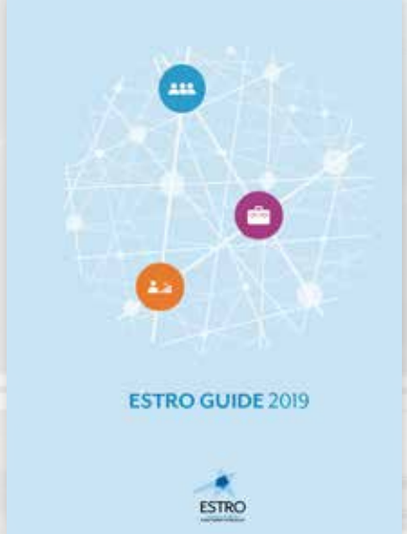
Mike and Bert: Thank you!

Rob Coppes
Chair of the ESTRO radiobiology committee
University Medical Centre Groningen
The Netherlands

ESTRO SCHOOL

ESTRO SCHOOL

"What an exciting School programme is in prospect for 2019!"



2019 ESTRO GUIDE:
user-swndwmf.cld.bz/
ESTRO-Guide-2019

September and October have been extremely busy educational months at ESTRO with 12 courses attended by more than 1,000 participants. Reports of most of these courses can be found in the next pages of this School Corner to give you a flavour of our educational activities.

Furthermore, the three new School courses in 2018 ('Foundations of leadership in radiation oncology', 'Multidisciplinary management of non-melanoma skin cancer' and 'Positioning and immobilisation for radiation therapy') were a great success and had waiting lists. For those of you who could not register, these three courses will run again next year; therefore book ahead! Online registration in now open for all the live courses.

You will also find the whole ESTRO School programme for 2019, not only for all live courses but also for the blended online FALCON contouring workshops. In terms of new courses, find out all about the one dedicated to academic entrepreneurship and the revamped research course on radiation oncology, which will train you to develop research programmes with new technologies. This first edition will be dedicated to the implementation of the MRI linac in a radiation oncology department.

What an exciting School programme is in prospect for 2019!

Jesper Eriksen, Marie-Catherine Vozenin and Christine Verfaillie

JESPER ERIKSEN
Chair of the education council

MARIE-CATHERINE VOZENIN
Member of the education council

CHRISTINE VERFAILLIE
ESTRO Managing director education and science

ESTRO SCHOOL

FALCON CONTOURING WORKSHOPS

2019 ONLINE WORKSHOPS PROGRAMME

Mark your calendar

ESTRO SCHOOL

Experience the FALCON programme

ESTRO contouring platform

FALCON and its experts can support you to develop:
- your contouring skills
- your knowledge on tumour sites
- your clinical research studies
- delineation guidelines for target volumes and OAR

Register now: www.estro.org/school/articles/online-workshops/online-workshops-schedule

FALCON

2019 ONLINE CONTOURING WORKSHOPS

Each online workshop includes two sessions

WORKSHOP	DATES	FACULTY
CNS cancer	22 January 2019 29 January 2019	Sarah Jefferies and Pinelopi Gkogkou
Lung cancer	12 February 2019 19 February 2019	Esther Troost and Jan Bussink
Spine SBRT	26 Febraury 2019 5 March 2019	Arturo Navarro and Robert Förster
Breast cancer	12 March 2019 26 March 2019	Philip Poortmans and Birgitte Offersen
OAR - head and neck	2 April 2019 9 April 2019	Jon Cacicedo and Olwen Leaman
Gynaecological cancer - BT	21 May 2019 28 May 2019	Ina Jurgenliemk-Schulz and Umesh Mahantshetty
Anal cancer	25 September 2019 2 October 2019	Maria Hawkins and Chiara Valentini
OAR - abdomen	8 October 2019 15 October 2019	Thomas Brunner and Alejandra Mendez Romero
Head and neck cancer	12 November 2019 19 November 2019	Vincent Gregoire and Jesper Eriksen
Liver SBRT	2 December 2019 9 December 2019	Berardino De Bari and Esat-Mahmut Ozsahin

ESTRO SCHOOL

COURSE REPORTS

Image-guided radiotherapy and chemotherapy in gynaecological cancer: focus on MRI-based adaptive brachytherapy

2-6 September 2018 | Madrid, Spain

Clinical practice and implementation of image-guided stereotactic body radiotherapy

2-6 September 2018 | Porto, Portugal

Physics for modern radiotherapy: a joint course for clinicians and physicists

9-13 September 2018 | Budapest, Hungary

Basic clinical radiobiology

15-19 September 2018 | Dublin, Ireland

Advanced treatment planning

23-27 September 2018 | Athens, Greece

Advanced physics for brachytherapy

7-10 October 2018 | Valencia, Spain

ESTRO SCHOOL

Image-guided radiotherapy and chemotherapy in gynaecological cancer: focus on MRI-based adaptive brachytherapy

2-6 September 2018
Madrid, Spain

Course directors: Richard Pötter, Radiation Oncologist, Medical University Hospital, Vienna (Austria)
Kari Tanderup, Medical Physicist, University Hospital, Aarhus (Denmark)

Since its inception in 2004, the team have educated and inspired over 2,000 participants and this year was no different, with 81 participants representing 23 countries.

NILUJA THIRU

ANTHEA CREE

The 'Image-guided adaptive radiotherapy in gynaecological cancer' course was held in Madrid, Spain, just around the corner from the historic Plaza de Toros de Las Ventas. Since its inception in 2004, the team have educated and inspired over 2,000 participants and this year was no different, with 81 participants representing 23 countries. The aim this year was for delegates to understand the rationale for advanced image-guided brachytherapy techniques and to equip them with the skills to update and change clinical practice at their institution.

Enthusiastic faculty members led by Professors Richard Pötter and Kari Tanderup, principal investigators of the successful and ongoing EMBRACE study, taught the course, so we knew the next five days would be informative, engaging and enjoyable. The session kicked off with Dr Umesh Mahantshetty, who gave an excellent ▼

and clinically relevant lecture on anatomical consideration and the role of the gynaecological examination. This led nicely into the next series of talks on imaging-based anatomy, defining volumes as per International Commission on Radiation Units and Measurements (ICRU)-GEC-ESTRO recommendations and practical physics aspects of plan optimisation.

The course was peppered with a number of interactive online tools that were great in facilitating discussions between participants and faculty. The quiz sessions interspersed throughout the course and within the lectures were used to highlight key take-home messages as well as point out differences in practice. Adequate time was given over the five days for contouring exercises using FALCON and Min-Contouring (launched for the first time at this course and developed by Li Tee Tan and Simon Duke), with individual attention from faculty members and step-by-step feedback. The case-based group discussions were important to highlight different practices across the globe and the challenges faced with evidenced-based standardisation of radiotherapy treatment.

This year, for the first time, some sessions were split into a general and experienced track. The idea for the experienced track break-out sessions was for participants to present their patient cases supervised by faculty members (medical doctors and physicists) so that individual feedback on treatment practice can be obtained. The general track had a more elaborate educational component. Separate workshops were also held for physicists and radiation therapists (RTTs).

There is no ESTRO course without a great social event, and this year, it was in the heart of the city at the Colonial Norte Restaurant, followed by a party where students and staff danced the night away. This did not deter any participants from turning up early on the morning of day three to hear Drs Daniel Berger, Remi Nout and Primoz Petric present on dose planning principles and dose volume reporting to a full house. Although some of the talks did have a significant physics flavour, they were at a level accessible to all.

There was also a focus on brachytherapy for other gynaecological cancers, with the treatment of endometrial, vulval and vaginal cancer all covered in detail. The sessions were full of practical advice with useful information regarding the pros and cons of different techniques and applicators. Although the faculty were very enthusiastic about the benefits of brachytherapy, they also highlighted the complexity of many radical treatments. This would provide a great starting point for anyone wanting to broaden their service, as a guide to getting the correct hands-on experience.

The course covered adjuvant endometrial treatment with a comprehensive update of both radiotherapy and chemotherapy following the results of the PORTEC 3 study. We then moved on to an update from the EMBRACE study, providing the evidence for all that we had heard so far. Learning about the tremendous amount of work behind this trial was one of the most inspiring parts of the course. It is also exciting to consider the results, which will soon be available and no doubt discussed at future courses.

The final day concluded with a quiz. The answers from the delegates showed how much we had learnt. We also heard about the experience of developing image-guided brachytherapy in Spain, which despite challenges has been very successful. This course is highly recommended for anyone who treats patients with gynaecological malignancies, including both junior and experienced professionals. It provides an evidence-based guide for treatment and a roadmap for developing local services. The combined sessions were accessible to all delegates and are vital for such a ▼

multidisciplinary process. The course was tailored to the delegates based on a pre-course survey, and the approachability of the faculty meant that it was possible to ask any questions.

As with all ESTRO courses, both local and central organisation was excellent. We left the course inspired, and there is no higher recommendation than the fact that it has already led to some changes in practice in our department, with a vision for future service development.

Dr Niluja Thiru
Radiation oncologist
Department of Clinical Oncology
The Christie NHS Foundation Trust, UK
Division of Cancer Science,
University of Manchester, UK
nilujat@ausdoctors.net

Dr Anthea Cree
Clinical oncologist
Department of Clinical Oncology
The Christie NHS Foundation Trust, UK
Division of Cancer Science,
University of Manchester, UK
Anthea.Cree@christie.nhs.uk

ESTRO SCHOOL

Clinical practice and implementation of image-guided stereotactic body radiotherapy

2-6 September 2018
Porto, Portugal

Course directors: Matthias Guckenberger, radiation oncologist, University Hospital Zurich, Zurich (Switzerland)
Dirk Verellen, medical physicist, Iridium Kankernetwerk, Antwerp, Vrije Universiteit Brussel, Brussels (Belgium)

KATHERINE STANLEY

There were 180 participants in total, split roughly: 60% radiation oncologists, 20% physicists, and 20% radiation therapists and dosimetrists

What a week in the sunny city of Porto, Portugal! Travelling from the middle of winter in New Zealand, I was looking forward to the heat that Portugal promises in the first week of September. It did not disappoint. Thankfully, there was a free afternoon to go to the beach as well as taste the finest port the region has to offer. The trip was also my first time trying the famous Pasteis de Nata, a type of custard tart, and I must say, thank goodness these are not readily available in New Zealand, as my health would suffer.

The course was fully booked three months ahead, so I was grateful to secure my spot. There were 180 participants in total, split roughly: 60% radiation oncologists, 20% physicists, and 20% radiation therapists and dosimetrists. This was also approximately the proportional focus of course content designed for these different disciplines.

Each day alternated between practical and fundamental principles, and the clinical evidence to support such techniques. This gave each discipline an easy-to-follow day, alternated with a steep-learning curve day, which made for great coffee break discussions with participants from other disciplines. Ample time was made ▼

available during the course for participants to ask questions and offer comments, and this opportunity was well utilised.

I was impressed with the amount of clinical evidence that the trainers were able to collate and present during the course. The faculty presented the material in such a way that it was fast-paced, but easy to follow and understand. It was an invaluable opportunity to attend a single course presenting this evidence, in contrast to the months it would take to read the published data as part of our busy schedules. This year, the course covered in detail the following body sites: brain, liver, spine, lung, adrenals, prostate and pancreas.

The breakout sessions for the individual disciplines were a highlight for me. Colleagues from all over the world shared their experiences and solutions to the various problems we face with implementing, maintaining and progressing stereotactic programmes.

Lunch was a very social affair, served with delicious Portuguese wine, which you could delight in at your own peril if you planned to stay alert in the afternoon sessions.

One feature of a multidisciplinary course like this is that you really gain an insight into the complexity of what is involved in each other's roles within the project team. I gained a wider appreciation for the decisions that clinical oncologists face with starting new treatment techniques, and in return, the work involved in determining appropriate margins and the technique development that occurs prior to a new treatment technique being rolled out.

The key take-home message for me was the importance in investing in adequate staff education and training and protocol development within your department before investing in expensive specialised equipment. The faculty recommend starting simple and then improving your technology as necessary once your team becomes more confident in dealing with the common challenges.

The course was an excellent summary of the current status and future developments in all things stereotactic. I would highly recommend attending on a semi-regular basis to knowledge share and reflect on your practices and to take away inspiration for implementing in the next body site.

This is a course for beginners and the experienced alike. If you have recently started a stereotactic programme in your department or are looking to start, it is a 'must'. I will definitely attend again as it was evident how quickly this field is evolving and the faculty strive to update the course material at the rate that new data becomes available.

Katherine Stanley
Medical physicist
Waikato Hospital
Hamilton, New Zealand
Katherine.Stanley@waikatodhb.health.nz

ESTRO SCHOOL

Physics for modern radiotherapy: a joint course for clinicians and physicists

9-13 September 2018
Budapest, Hungary

Course director: Professor Ben Heijmen, medical physicist, Erasmus MC - Cancer Institute, Rotterdam (The Netherlands)

EVA-MARIA KRETSCHMER

A RADIATION ONCOLOGIST'S PERSPECTIVE

This was an interesting and extensive course, very well led by the course director, Professor Ben Hejmen. International speakers were physicists as well as physicians from university hospitals with a large number of patients. All the significant topics in modern radiotherapy planning, including physical and clinical fundamentals, were covered.

For the participants, it was very helpful to have printouts of the presentations on the day. Some of the presentations covered a very wide range of material. Possibly a separate document regarding the learning material would be helpful.

Also, the idea of implementing a "top ten of the day" list came up during discussions among the participants. This would be a list of the ten most important topics / take-home messages of the day, with further background information chosen and explained by participants.

The homework assignment caused quite a stir. "I almost had a heart attack", said one participant on the moment that she read the extensive assignment. Three clinical cases with both radiation planning and questions had to be completed before the course, as part of an interdisciplinary team. Presenting the results in front of the entire group was a challenge for many participants, with different approaches and points of focus adopted by participants with different professional backgrounds and experience. Many participants found it difficult to produce a correct and thorough execution of each case study. Overall though, it was very helpful and interesting to see how many different approaches were possible and to gain a small insight into how other institutions work.

The course consisted of a good mix of participants from different backgrounds (RTT, physicists and physicians, and radiobiology PhD students) and levels of experience. The networking was good, but could perhaps have been further supported. The social dinner played a positive part in this. The cruise on the Danube, with a delicious buffet and dancing to a live DJ on a beautiful late-summer night, was definitely a highlight.

Eva-Maria Kretschmer
Resident in radio-oncology
University Hospital of Zürich
Zürich, Switzerland
eva-maria.kretschmer@usz.ch

A MEDICAL PHYSICIST'S PERSPECTIVE

This 'Physics for modern radiotherapy' ESTRO course is aimed at all medical physicists who work in radiation therapy as well as radiation oncologists. The intensive five-day programme of lectures covered all the ways in which a physicist is involved in the radiotherapy department. In a multidisciplinary teaching group such as this, it is a real challenge to ensure that the balance of material and the educational level suits both physicists and oncologists. In my opinion, the ESTRO course organisers overcame this challenge well.

BEHNAZ CHEHRAZI

The topics discussed not only covered all the daily issues in radiotherapy (intensity-modulated radiation therapy (IMRT), image-guided radiation therapy (IGRT), radiobiology, proton therapy, brachytherapy and commissioning / quality assurance of linacs), but also some of latest clinical research being produced in Europe.

One strength of the course was that in some lectures, students were separated into groups of physicists or oncologists, to ensure that they could get the most out of the lecture. The course also started and ended with a test, so that participants could evaluate their level of knowledge at the start and assess how much they had learnt by the end. ▼

An assignment was issued before the course, which included performing treatment planning for three patient cases: head and neck, breast and lung. During the course, participants were invited to discuss their plan with an oncologist and a physicist and to compare their protocols with other hospitals in other countries. For me, this interaction and learning with our international colleagues was the best aspect of the course, and was a feature of all the coffee breaks and the very enjoyable dinner. The take-home messages at the end of the lectures provided good pointers on how to optimise our methods in the clinic.

The course were very well organised, which helped to make my first ESTRO course experience in Budapest very memorable. I would like to express my deep gratitude to the course director, Professor Ben Heijmen, the faculty and the course organiser Laura La Porta. I hope that this course continues to draw together people working in this field each year to learn and share knowledge.

Behnaz Chehrazi
Medical physicist
Örebro University Hospital
Örebro, Sweden
behnaz.chehrazi@regionorebrolan.se

ESTRO SCHOOL

Basic clinical radiobiology

15-19 September 2018
Dublin, Ireland

Course director: Michael Joiner, Radiation Biologist, Wayne State, University, Detroit (USA)

The course attracted 100 participants representing different professions, including physicians, physicists, biologists and others

BARBARA B BALWA

Over five days in mid-September a group of 100 participants representing different professions, including physicians, physicists, biologists and others, gathered in a suburb of Dublin to revise and improve their knowledge of the principles of radiobiology.

The main focus of the course was external photon radiotherapy, supplemented by material covering particle therapy and brachytherapy. Other therapies complementary to radiotherapy were also touched upon, including chemotherapy, hormonal therapy and immunotherapy. ▼

As a participant I was reminded about the complexity of interactions and phenomena in the body when it is irradiated, about different types of cell death, the hallmarks of cancer, models that describe cell survival in response to ionising radiation and the, at least, 8 or 9 'Rs' [1] of radiotherapy. The course also covered the possibilities and limitations of using simplified models (e.g. mathematical models) and/or investigation methods (*in vitro* measurements and animal studies). Many data that allow us to understand processes in radiobiology comes from *in vitro* measurements, with studies carried out in highly controlled and often very simplified conditions. This results in some discrepancy between the expected and observed results of ionising radiation when analysing *in vivo* results.

Each set of lectures was followed by time for questions, with the lecturers, specialists in their fields, more than happy to answer any question. In addition, participants were offered three sessions for 'brain exercises' and discussions. This included a session on calculations dedicated to the application of the linear-quadratic model (LQ-model) and two clinical case study sessions, each of which involved making decisions about treatment methods and prioritising.

After a day of intensive lectures, participants took their chance to socialise with old and new colleagues from all over the world. The social highlight of the second day was the Irish food trail experience, which involved a delicious three-course meal, with each course in a different Dublin restaurant or pub. Over the week everyone had the opportunity to explore the city centre, try local dishes, listen to fine Irish music and even experience the famous Irish weather.

The most important take-home messages for me from the course were:

- Never exceed an overall treatment time
- Ensure that you leave enough time between consecutive fractions, to allow for repair of the normal tissue
- It is extremely important to define end-points for normal tissue complications
- We must cooperate internationally to get enough *in vivo* data for normal tissue complications occurring for other than standard fractionation schedules. As part of this, clinical trials must be conducted to high standards, with clear end-points and follow-up times specified
- Not every question can be answered in a simple way, with answers dependant on a large number of variables. It is important to seek help from other specialists and to analyse problems in their entirety.

In other words, if you are based in a clinical environment and are planning to take this course to get strict, simple, preferably one-word answers for every question that you have, then you are unlikely to be satisfied by this course. The complexity and interplay between different processes in the human body when irradiated with ionising radiation and our limited understanding of some of these processes mean that this is not possible. Instead, by taking this course you will develop knowledge that will allow you analyse scenarios and solutions in many of the cases that you will come across in your career.

Barbara B Balwa
Medical physicist
Department of Medical Physics, Department of Radiotherapy
Mälarsjukhuset Hospital
Eskilstuna, Sweden
barbaraboguslawa.balwa@dll.se

[1] Radiosenstitivity, Rapair, Repopulation, Redistribution, Reoxygenation, iRRadiated volume, Restoration (long term recovery), Re-iRRadiation, immunotheRapy

Advanced treatment planning

23-27 September 2018
Athens, Greece

Course director: Gert Meijer, Medical Physicist, UMC Utrecht, Utrecht, The Netherlands

Co-chair: Neil Burnet, Radiation Oncologist, Cambridge University and Addenbrooke's Hospital, Cambridge, UK

The 'Advanced treatment planning' course received a very positive response, attracting 100 participants from 25 different countries gathered in Athens

GEORGIA PRENTOU HELEN PRENTOU

The ESTRO 'Advanced treatment planning' course was held this year in Athens, Greece. It received a very positive response, attracting 100 participants from 25 different countries. The course satisfied a deeply felt need for a comprehensive understanding of all parts of the planning process, including evaluation and optimisation for intensity modulated radiotherapy (both 'step-and-shoot' intensity-modulated radiation therapy (IMRT) and volumetric modulated arc therapy (VMAT)).

The course offered a rich programme consisting of 19 hours of lectures, nine hours of practical workshops, and four hours of case discussions. It covered topics relevant to the daily clinical ▼

practice of a range of medical specialties, including medical physicists, dosimetrists, radiation oncologists, and radiation therapists (RTTs). Topics included the application of International Commission on Radiation Units and Measurements (ICRU) recommendations in treatment planning, practical guidelines for both 'step-and-shoot' IMRT and VMAT, physical and biological optimisation, Pareto fronts, dealing with geometric uncertainties, adaptive planning strategies, dose painting, and robust and probabilistic planning. Online voting polls and question and answer sessions during the lectures led to interactive and thorough discussion of these topics.

The practical workshops included individual planning using different treatment planning systems, as well as presentations from vendors. Vendors and teachers offered excellent guidance and support on the complex case exercises, which included breast, central nervous system, lung, and head and neck cancer. Participants collaborated in pairs to prepare plans and exchanged knowledge with others around the table by drawing on their own experience and expertise. At the end of each day, all plan data were gathered and presented next morning in the form of summarised tables and graphs offering food for thought. By the end of the practical workshops all participants were more familiar and comfortable with the use of the technologies and planning strategies covered in the lectures.

Last but not least, a social dinner was held in the heart of Athens. This provided a great opportunity for participants to get to know each other better and share a lovely evening in a welcoming atmosphere, with traditional Greek cuisine and a beautiful view of the Acropolis.

Overall, the course was an illuminating experience for everyone and is highly recommended for international colleagues. The learning objectives, including increasing accuracy as well as effectiveness in the planning process, understanding the basis for comparing different plans for the same case and also managing competing priorities in planning, were achieved. On behalf of everyone who attended, we would like to thank the course director Gert Meijer, the teaching faculty, the local organisers and the ESTRO project managers for their vital contribution. Completing an advanced course like this will have a significant impact on one's daily clinical practice.

Helen Prentou (MSc)
Medical physicist, PhD Candidate
Medical Physics Laboratory, Medical School,
National and Kapodistrian University of Athens
Athens, Greece
eprentou@med.uoa.gr

Georgia Prentou (MSc)
Medical physicist, PhD Candidate
Medical Physics Laboratory, Medical School,
National and Kapodistrian University of Athens
Athens, Greece
geoprentou@gmail.com

ESTRO SCHOOL

Advanced physics for brachytherapy

7-10 October 2018
Valencia, Spain

Course director: Dimos Baltas, physicist, University of Freiburg, Freiburg (DE)

"This was a great learning experience, which covered a wide range of contemporary brachytherapy physics topics"

JAMEMA SWAMIDAS

As a clinical brachytherapy medical physicist working in a hospital with a busy brachytherapy programme, I treat a wide range of patients, including those with cervical cancer, breast, head and neck cancer, and soft-tissue sarcomas. I was attracted to this course because I wanted to improve my theoretical and practical understanding of physics for brachytherapy, particularly the most recent advances. I had some specific learning objectives, which were met, thanks to the well-structured programme, which covered a wide range of subjects through lectures and practical sessions, and was led by the course director Professor Dimos Baltas and an excellent faculty team. ▼

In the piece below, I will cover some of the highlights of the course.

Imaging and localisation
Imaging has brought about a paradigm shift in the practice of brachytherapy in the last decade. However, physics-related issues in imaging have been largely neglected. This course helped me to deepen my understanding, especially about issues related to quality assurance (QA), tissue segmentation, characterisation and localisation.

Dose calculation algorithms
I had two main learning objectives for the course: i) dose calculation algorithms, and ii) source strength dosimetry. I was very happy to see that one full day was dedicated to these important topics. Although there is quite a lot of literature on the topics, it is much easier to understand the concepts with a teacher explaining them. In particular, the lecture by Professor Luc Beaulieu covered a whole spectrum of clinical examples, which helped to clarify things for a clinical physicist like me. For someone who has never done any Monte Carlo simulation, the lecture by Professor PPanagiotis Papagiannis, was very informative, as was the session on TG43 dosimetry by Professor Marc Rivard.

The day continued with more lectures from Prof Papagiannis about advanced collapsed cone engine and grid-based Boltzmann solver. As a weak mathematician, and not a great theoretical physicist, I was slightly lost in the middle of the lecture. However, barring the 40-50 equations, I understood the concepts, strengths, and limitations of each of these algorithms, which were summarised very well at the end of the lecture. At home I plan to go through the presentation slides again to try to understand the algorithms in more detail.

After lunch, the practical session on commissioning model-based dose calculation algorithms (MBDCA) was excellent, especially as I will soon be involved in commissioning an MBDCA.

Optimisation and prescription
A classical lecture on plan evaluation methods by Professor Jose-Perez Calatayud was very reassuring for our brachytherapy practice back home. Apart from the lectures about plan evaluation, prescribing and reporting, it was interesting to know more about the inverse planning algorithms and optimisation methods from Professor Dimos Baltas. This topic opened up some valuable discussion and debate about the benefit of inverse planning for various brachytherapy applications such as gynaecological, prostate, and breast cancer, which highlighted opportunities for more research for both physicists and vendors.

Dosimetry
This session covered a wide range of topics, including source strength determination, experimental methods – various dosimeters such as Thermo Luminescent Dosimeter and film, and their strengths and limitations. The session ended with newer topics such as treatment delivery methods and in vivo dosimetry. What was striking is, despite the complexities involved in *In-vivo* dosimetry in brachytherapy, as compared to external beam radiation therapy, a lot of research is being done in this area, which gives us hope that, there will be a practical solution for dose verification in the near future.

Quality management
A physics course is not complete unless we discuss quality management issues, which ▼

were well illustrated. This part of the programme also included a comprehensive talk on the clinical impact of uncertainties by Professor Nicole Nesvacil.

Future perspectives
This session was quite an eye-opening one for me, in which the latest advances such as real-time tracking technologies, fibre optics shape sensing, novel applicators, electronic brachytherapy and new radionuclides were discussed in detail. This suggested a lot of new avenues for future research and development.

Social event and the organisation
This course report would not be complete without a mention of the social event, which involved a visit to the countryside, where we were able to learn about farming methods in Valencia. Most importantly, I has an opportunity to cook paella, a popular Spanish dish. Thanks to project manager Alessandra and our local organisers Professors Facundo Ballester and José Perez-Calatayud for organising this wonderful event.

A special thanks also to the brachytherapy suppliers Bebig, Varian and Elekta, who supported the course, particularly during the practical sessions.

In summary, this was a great learning experience, which covered a wide range of contemporary brachytherapy physics topics and was taught by an excellent team.

Jamema Swamidas
Medical Physicist, ACTREC
Tata Memorial Centre
Mumbai, India

ESTRO SCHOOL

REPORT ON AMEE CONFERENCE 2018

Report from the Association for Medical Education in Europe (AMEE) Conference 2018

ESTRO School of Pedagogy grant

25-29 August 2018 | Basel, Switzerland

REPORTS BY:

Chiara Valentini

Jose Lopez

Simon Duke

The AMEE congress in Basel, Switzerland, was a source of inspiration for the many that attended. A range of interesting topics were explored, including some that are already present in our everyday work, but which haven't yet been formally documented.

The congress opened with a symposium given by Bertalan Mesko, an expert in the future of medicine. From the time of his childhood passion for science fiction movies, Mesko has imagined a technologically advanced medicine. But the reality today is very different. Patients are still seen in outpatient clinics, which apart from the presence of computers, are similar to those of years ago. The reasons are many. One is that doctors are not inclined to change (this was a theme of the course). Given the important role that computers play in our medical systems, Mesko argues that it is essential that we understand and engage with them. He asks us to be curious and willing to open doors to scenarios that are already, in part, reality; for example, the possibility of genetic screening to assess the susceptibility to diseases.

On the second day I found the symposium on virtual reality (VR) and augmented reality (AR) very interesting. VR simulates a reality in which the learner explores a subject, while in AR there is a projection into real life. The purpose of these learning methods is to provide students with realistic, visual and auditory learning opportunities, which can be repeated and tested safely. They are more likely to sustain a higher level of attention among students than simply listening passively to a lesson or learning by reading a book or using a computer. One speaker highlighted the interesting fact that the real moment in which you learn is the moment in which you switch from being a learner to a teacher.

Another session that I found very interesting was the symposium dedicated to the education of patients in the internet-age, which is already a reality for many health professionals. The internet enables patients today to search for information about their illness, not only on search engines, such as Google, but also on sites such as PubMed, which provide open-access to medical research articles. Alongside this, social media sites such as Facebook and Instagram enable patients to gather information on the lives of their doctors and healthcare staff, as well as to use these tools as a means of communication, expecting rapid responses. In addition, patients can access sites that assess medical competence and performance, providing them with the information to choose where and by whom to be treated.

This reality, which is increasingly prevalent, obliges us to face the issues it raises, and not to ignore them or to simply say to patients that they do not have the necessary knowledge or experience to understand. We need to be aware of how patients use the web, to collaborate with them and to be prepared to give them satisfactory answers. We also need to be aware of what information we place on the internet and how our professional work is represented.

Chiara Valentini
Radiation oncologist
OncoRay, Klinik und Poliklinik für Strahlentherapie und Radioonkologie
Universitätsklinikum Carl Gustav Carus an der Technische Universität Dresden, Germany
chiara.valentini@uniklinikum-dresden.de

CHIARA VALENTINI

It was with great pleasure that I attended the Association for Medical Education in Europe (AMEE) Conference in August 2018 in the beautiful city of Basel, Switzerland. The AMEE Conference is widely recognised as the key annual medical and healthcare professions education conference, attended by colleagues from around the world.

The conference gives you the opportunity to participate in stimulating, thought-provoking interactive sessions, taking in plenaries, symposia, short communications, pre-conference and conference workshops, research papers, and doctoral reports. The PechaKucha™ sessions particularly caught my attention. They are a simple presentation format where 20 slides are shown, each for 20 seconds. The challenge for the presenter is to cover what they wish to say within the 20-second limit.

There were tracks covering undergraduate education, postgraduate education and training, continuing professional development, and educational research in all the healthcare professions. It is a remarkable experience to be able to network with international colleagues both in and out of the sessions, allowing you to get a global perspective on what is happening in medical and healthcare professionals' education. It helps you to think critically about your teaching skills, the future direction of medical education, and have an overview of the curriculum and the roles of learners and educators.

I would like to highlight the particularly motivating and enthusiastic plenary session given by Bertrand Piccard, the Swiss psychiatrist, aviator and explorer. An influential voice heard among the most distinguished institutions across the globe, Bertrand urged us to go beyond the obvious and achieve the impossible. The inspiration I received from this pioneer filled me with the desire to continue inspiring other colleagues.

There was an interesting symposium about virtual and augmented reality, two digital technologies which are being introduced in healthcare education and have the potential to fundamentally change teaching. These technologies allow either an actual, simulated or augmented view of a real-world environment to be virtually projected, and provide opportunities for students to engage in unique learning experiences. Although these technologies are very pedagogical, there is considerable debate about how they can be implemented and whether they are a supplement to current teaching models, or could replace them altogether.

On the second day, I attended some short communications exploring the role of feedback as a tool to support learning. Feedback promotes learning by informing trainees of their progress, advising them about observed learning needs and resources available to facilitate their learning, and motivating them to engage in appropriate learning activities.

Last but not least, I enjoyed a nice pizza and beer evening with my other ESTRO colleagues. Exchanging our impressions and experiences of the conference was very enriching. We also shared our experiences as educators in our own countries. It is interesting to see how some educational issues are common in different countries.

I would like to thank ESTRO for their support in enabling me to attend the conference. I returned home refreshed and invigorated, with new ideas to enhance my teaching.

Jose Lopez, MD, PhD
Radiation oncology
University Hospital Virgen del Rocio
Seville, Spain

JOSE LOPEZ

It was a great privilege to attend the Association for Medical Education in Europe (AMEE) 2018 conference in Basel, Switzerland in September, along with more than 3,700 other delegates from 104 countries.

There was a palpable air of excitement at the conference opening ceremony, which was streamed live around the world. The opening plenary on 'Science fiction in medical education' by Bertalan Meskó, from the Medical Futurist Institute, was a thought-provoking insight into the potential of technology to shape medical education in the forthcoming decades.

This was followed the next morning by an inspirational talk by Bertrand Piccard, a Swiss psychiatrist and explorer, who, in addition to being part of the first team to complete a non-stop balloon flight around the globe, was the initiator, chairman and co-pilot of Solar Impulse, the first successful round-the-world solar powered flight. He spurred us towards creativity, innovation and questioning our assumptions: "It's not the people who made the best candles that invented the light bulb".

The four days of scientific content then began in earnest, with early highlights for me being the 'surgical education and simulation' oral

The conference was a fantastic opportunity to be inspired, listen and discuss broadly, and to further develop research ideas

presentations, and the posters and reports featuring virtual patients in virtual reality from the technology enhanced learning (TEL) sessions.

As a clinical oncology trainee from the UK currently engaged in a doctoral research degree concerning the teaching and assessment of higher skills in radiotherapy, getting a chance to discuss my project informally and hear about others' work was invaluable. The doctoral thesis presentations really helped me to gain an idea of the standard that I should be aiming for at the end of my degree. I also was able to attend a 'clinic', where I was able to discuss my assessment methodologies with experts in the field, which generated new ideas on study methodologies that I could use.

The 'gamification' workshop, where we were encouraged to design a 'serious game' for ▼

ESTRO at AMEE 2018

educational purposes, was great fun and sparked creative discussion among the attendees. Some of the more esoteric but interesting presentations were from the dean of the first new medical school in Japan for 25 years, and from educators trying to attract more specialist trainees to the Australian outback.

Attending the conference with ESTRO delegates from Spain, Germany and Belgium was very enjoyable, and also a good chance to hear about their experiences in radiotherapy education and think together about developments at AMEE that could be applied to radiotherapy education. We all agreed that there is an exciting opportunity to report and share the experiences of the ESTRO School in this arena.

In all, the conference was a fantastic opportunity to be inspired, listen and discuss broadly, further develop research ideas, and have fun.
Thank you ESTRO.

Dr Simon Duke
Senior clinical research
fellow, radiotherapy
Cambridge University Hospitals, Cambridge, UK
simon.duke@nhs.net

The view on an early morning run along the Rhine, Basel

SIMON DUKE

ESTRO School of Radiotherapy and Oncology

WWW.ESTRO.ORG

2019

ESTRO School

POSTGRADUATE COURSES IN EUROPE

Comprehensive Quality Management in Radiotherapy – Risk Management and Patient Safety
15-18 February 2019 | Moscow, Russia

Image-Guided Radiotherapy in Clinical Practice
17-21 February 2019 | Porto, Portugal

Basic Clinical Radiobiology
3-7 March 2019 | Brussels, Belgium

Comprehensive and Practical Brachytherapy
3-7 March 2019 | Athens, Greece

Particle Therapy
18-22 March 2019 | Groningen, The Netherlands

Lower GI – Technical and Clinical Challenges for Radiation Oncologists
20-22 March 2019 | Amsterdam, The Netherlands

Upper GI – Technical and Clinical Challenges for Radiation Oncologists
23-26 March 2019 | Amsterdam, The Netherlands

Foundation of Leadership in Radiation Oncology
26 April 2019 | Milan, Italy

ESTRO/ESMIT course on Molecular Imaging and Radiation Oncology
6-9 May 2019 | Florence, Italy

Advanced Skills in Modern Radiotherapy
19-23 May 2019 | Brussels, Belgium

Multidisciplinary Management of Prostate Cancer
19-23 May 2019 | Pisa, Italy

Dose Modelling and Verification for External Beam Radiotherapy
19-23 May 2019 | Lisbon, Portugal

Target Volume Determination – From Imaging to Margins
2-5 June 2019 | Athens, Greece

IMRT and Other Highly Conformal Techniques in Practice
2-6 June 2019 | Budapest, Hungary

Brachytherapy for Prostate Cancer
13-15 June 2019 | Prague, Czech Republic

Evidence Based Radiation Oncology
24-29 June 2019 | Montpellier, France

Clinical Practice and Implementation of Image-Guided Stereotactic Body Radiotherapy
1-5 September 2019 | Florence, Italy

Physics for Modern Radiotherapy
A joint course for clinicians and physicists
8-12 September 2019 | Riga, Latvia

Advanced Treatment Planning
22-26 September 2019 | Budapest, Hungary

Imaging for Physicists
29 September - 3 October 2019 | Manchester, UK

Image-Guided Radiotherapy and Chemotherapy in Gynaecological Cancer: Focus on MRI Based Adaptive Brachytherapy
12-16 October 2019 | Cluj, Romania

Comprehensive Quality Management in Radiotherapy – Quality Assessment and Improvement
13-16 October 2019 | Dublin, Ireland

Best Practice in Radiation Oncology
Train the RTT (Radiation Therapists) Trainers - Part II
14-16 October 2019 | Vienna, Austria

Positioning and Immobilisation for Radiation Therapy
19-20 October 2019 | Brussels, Belgium

Multidisciplinary Management of Breast Cancer
27-30 October 2019 | Budapest, Hungary

Research Course in Radiation Oncology
How to develop research/validation programmes when implementing new technology?
Edition 1: MRI Linac
3-6 November 2019 | Madrid, Spain
NEW

Research Course in Radiotherapy Physics
3-6 November 2019 | Madrid, Spain

ESTRO/ESOR Multidisciplinary Approach of Cancer Imaging
4-5 November 2019 | Rome, Italy

Multidisciplinary Management of Non-Melanoma Skin Cancer
7-9 November 2019 | Brussels, Belgium

Palliative Care and Radiotherapy
A course on prognosis, symptom control, re-irradiation, oligometastases
26-28 November 2019 | Brussels, Belgium

Paediatric Radiotherapy
1-3 December 2019 | Utrecht, The Netherlands

Multidisciplinary Management of Brain Tumours
1-3 December 2019 | Brussels, Belgium

POSTGRADUATE COURSES OUTSIDE EUROPE

3D Radiotherapy with a Special Emphasis on Implementation of MRI/CT Based Brachytherapy in Cervical Cancer
14-17 March 2019 | Rishikesh, India

Palliative Care and Radiotherapy
A course on prognosis, symptom control, re-irradiation, oligometastases
26-28 March 2019 | Manila, Philippines

Combined Drug-Radiation Treatment: Biological Basis, Current Applications and Perspectives
7-9 June 2019 | Seoul, South Korea

Multidisciplinary Management of Head and Neck Oncology
28-31 October 2019 | Mexico City, Mexico

Advanced Technologies
3-6 November 2019 | Shenzhen, China

Advanced Technologies
India | Date and venue to be announced

PRE-MEETING COURSES

Eight Pre-Meeting Courses at ESTRO 38
26 April 2019 | Milan, Italy

UNDERGRADUATE COURSES

Medical Science Summer School Oncology for Medical Students
15 -27 July 2019 | Vienna, Austria

ESO-ESSO-ESTRO Multidisciplinary Course in Oncology for Medical Students
26 August - 6 September 2019 | Turin, Italy

MULTIMODAL CANCER TREATMENT · RADIOTHERAPY TREATMENT PLANNING AND DELIVERY · BIOLOGY · IMAGING · RESEARCH · BEST PRACTICE

European School of Oncology

Oncology e-learning

Your Education, *free and just a click away!*

www.e-eso.net

e-Learn
with our experts, discussants and materials

Access
any materials available on the site at any time

Recorded

Connect LIVE
on Thursday at 18:15 CET

Interact
by asking questions to our experts BEFORE, DURING and AFTER the live sessions

Get
CME credits

Create
your own e-ESO agenda

TOPICS	CONTENT
• Medical Oncology	• Highlights
• Surgical Oncology	• Pathways
• Radiation Oncology	• Debates
• Haemato Oncology	• Grandrounds
• Nursing	• Oncoreviews
AND MUCH MORE!	• Clinical cases
	• Slides

THURSDAY, ENTER THE LIVE SESSION AND INTERACT

9:15
San Francisco

12:15
Boston, New York

14:15
Buenos Aires

17:15
Dublin, Lisbon, London

18:15
Madrid, Paris, Rome

19:15
Cairo, Cape Town, Tel Aviv

20:15
Moscow

21:15
Dubai

22:45
Mumbai

Keep up-to-date via #e_ESO

Your regular appointments with education organised without commercial sponsorship by the European School of Oncology in collaboration with

CRITICAL REVIEWS IN Oncology Hematology

YOUNG ESTRO

YOUNG ESTRO

"This study has been developed by young ESTRO to explore burn-out syndrome in radiation oncology"

Dear readers,

In this Young Corner we cover the results of the ESTRO multidisciplinary survey dedicated to learning in radiation oncology in Europe. The survey was set up to investigate the organisation, duration and cost of educational programmes in radiation oncology in Europe as well as the perceived quality of the training and ESTRO's role in these activities. The results have been published in *Clinical and Translational Radiation Oncology (ctRO).*

We also set out the rationale, outline and scope of the young ESTRO project on burn-out in radiation oncology. This study has been developed by young ESTRO to explore burn-out syndrome in radiation oncology and to investigate whether personality traits, such as alexithymia and empathy, affect the likelihood of developing the syndome. The aim of the project is to address this issue and to develop management strategies for individuals at risk.

This Corner also includes a course report from the sixth 'MR in radiation therapy (RT)' meeting, which was held in Utrecht, The Netherlands, earlier in the summer. The report describes an interesting event dedicated to an important topic, which also provided an excellent opportunity to mingle with leading scientists in a friendly environment.

Finally, we include a report from Catherine Coolens, a medical physicist from the Princess Margaret Cancer Centre in Toronto, Canada, who visited the MAASTRO Clinic, in Maastricht, The Netherlands, as part of an ESTRO mobility grant. At the clinic, Catherine learnt more about spectral modelling and dual energy material decomposition methods.

We wish you an enjoyable and productive end to the year. Do not forget to renew your membership for 2019 and to register for ESTRO 38 in Milan, Italy. It will be the main event for young radiation oncology professionals in 2019 and includes a dedicated young track with scientific and career-related content specially tailored to young ESTRO members.

Kathrine Røe Redalen and Pierfrancesco Franco

KATHRINE RØE REDALEN

PIERFRANCESCO FRANCO

YOUNG ESTRO

Learning radiation oncology in Europe: results of the ESTRO multidisciplinary survey

PIERFRANCESCO FRANCO

As long ago as 1991, ESTRO endorsed a 'minimum curriculum for theoretical education in radiation oncology (RO) in Europe', contributing to a European standard for training and education in radiation oncology [1]. In 2004 the second edition of the curricula for the 'Specialist Education and Training of Medical Practitioners in Radiotherapy (Radiation Oncologists)' was edited and endorsed by 35 European member states [2]. In 2011, the core curriculum was updated, shifting the focus from theoretical knowledge and skills to a competency-based education and training system [3]. A new version is currently being prepared.

Due to variation in national regulations, these curricula describe the knowledge and skills needed for the clinical use of ionising radiation, with the implementation of the training and education decided at the national level. A review of educational and training demographics, and levels of career motivation and professional opportunities for radiation oncology professionals is undertaken on a regular basis in several European countries and in the USA and Canada [4-7]. However, no data are available currently to compare educational needs and organisational approaches across Europe.

Against this background, the young ESTRO committee developed a multidisciplinary survey to assess the organisation, duration and cost of educational programmes in radiation oncology in Europe, as well as the perceived quality of training and ESTRO's role in this area [8]. The study was carried out between 2016 and 2017, with more than 460 participants completing the questionnaire. All the different professional areas within radiation oncology were represented.

Participants declared that the most important aspect of their education were practical skills, knowledge and competences. The preference for practical education rather than theoretical information supports the competencies-based approach undertaken by ESTRO in the most recent core curriculum.

The survey showed consistent differences in education systems within each specialty across Europe, despite the efforts made by governments and scientific societies to increase homogeneity. One significant example of harmonisation is the European Credit Transfer System (ECTS), which is a credit system enhancing an easier exchange for students within Europe. ECTS is based on an individual's educational achievements and the ▼

workload in their course. It is a central tool adopted by the Bologna Process, which aims to ensure national educational systems are more compatible and harmonised [9]. In this context, ESTRO can play a leading role in lobbying stakeholders, universities and schools in Europe to foster ECTS as part of its educational programmes for radiation oncology professionals.

More than a quarter of participants felt that national education programmes were not adequate for their needs. The ESTRO School was seen as an important source of knowledge and education, even if only a minority of respondents routinely attended meetings, because of lack of time and/or funding. In general, students found it difficult to combine education and training with the demands of clinical practice, research, administration and training junior colleagues. This is reflected in the low proportion of respondents satisfied with their own time allocation.

The content, organisation, and cost of radiation oncology educational programmes varies significantly across Europe. The ESTRO School plays a prominent role in providing quality education and bridging gaps among European countries, especially with the growing mobility of radiation oncology professionals within Europe. The development and spread of online educational tools (such as FALCON and DOVE) can be a strong incentive to continue learning using appropriate and modern platforms.

Further details on the results of the survey can be found in the article published in *Clinical and Translational Radiation Oncology (ctRO)* [10].

Pierfrancesco Franco, MD, PhD
Young ESTRO committee chair
Department of Oncology, Radiation Oncology
University of Turin, Italy

REFERENCES

[1] Leer JW, Overgaard J, Heeren G. The European core curriculum on radiotherapy. *Radiother Oncol* 1997;43:97-101.

[2] Baumann M, Leer JW, Dahl O, *et al*. Updated European core curriculum for radiotherapists (radiation oncologists). Recommended curriculum for the specialist training of medical practitioners in radiotherapy (radiation oncology) within Europe. *Radiother Oncol* 2004;70: 107-13.

[3] Eriksen JG, Beavis AW, Coffey MA, *et al*. The updated ESTRO core curricula 2011 for clinicians, medical physicists and RTTs in radiotherapy/radiation oncology. *Radiother Oncol* 2012; 103:103-8.

[4] Semarau R, Hansemann K, Adam M, *et al*. Quality of training in radiation oncology in Germany. Results of a 2006 Survey. *Strahelenther Onkol* 2008; 184: 239-44.

[5] Kantor G, Huguet F, Toledano A, *et al*. Radiation oncology training in France: demography, analysis of motivations of the young specialists, evaluation of the training. *Cancer Radiother* 2005;9:435-43.

[6] Gondi V, Bernard JR Jr, Jabbari S, *et al*. Results of the 2005-2008 association of residents in radiation oncology survey of chief residents in the United States: clinical training and resident working conditions. *Int J Radiat Oncol Biol Phys* 2011;81:1120-1127.

[7] Franco P, Ciammella P, Peruzzo Cornetto A, *et al*. The STYRO 2011 project: a survey on perceived quality of training among young Italian radiation oncologists. *Med Oncol* 2013;30:729.

[8] Bibault JE, Franco P, Borst GR, *et al*. Learning radiation oncology in Europe: results of the ESTRO multidisciplinary survey. *Clin Transl Oncol* 2018;9:61-7.

[9] The Bologna Process and the European Higher Education Area – Education and training – European Commission – Education and Training (available at: http://ec.europa.eu/education/policy/higher-education/bologna-process_en).

[10] Bibault JE, *et al*. Learning radiation oncology in Europe: results of the ESTRO multidisciplinary survey. *Clin Transl Radiat Oncol* 2018;9:61-7

YOUNG ESTRO

The yESTRO PROject on Burn-Out in RadiatioN Oncology – PRO BONO

PIERFRANCESCO FRANCO

Human beings are able to thrive within a given environment so long as they are able to maintain an individual balance (homeostasis), which is constantly challenged by intrinsic and extrinsic causes, also known as stress factors [1]. Stress can be seen as a physiological response in the shape of a 'general adaptation syndrome' and can be subdivided into three different phases: a) alarm, b) resistance, and c) exhaustion [1].

Individuals can implement coping strategies in response to stress, which have two main goals: changing the situation that is causing the stress and controlling the emotional response to the stressful agent. Certain coping strategies (emotional responses) may lead to exhaustion, a final stage in which the individual cannot re-establish inner balance. This may lead to so-called 'burn-out syndrome' (BOS), which was described by Maslach *et al* in the 1990s [2]. The term's significance is that it implies burning something to exhaustion, until it is completely consumed [3]. It is considered to be one of the most significant negative factors for physical and mental well-being within the working environment, and particularly affects healthcare professionals [4].

The three classic presentation clusters are: loss of enthusiasm for work (emotional exhaustion); reduced empathy and increased cynicism (depersonalisation); and a decreased perception of the meaningfulness of someone's work, finally leading to inefficacy (personal accomplishment) [2,4].

Symptoms can be classified into physical clusters (insomnia, lack of energy, back pain, loss of appetite, ulcer, migraine, nausea) and psychological clusters (cynicism, irritability, denial of failures, loss of sense of humour, indifference, insecurity, disinterest, indecision, reduction of self-esteem and loss of memory).

BOS is a stress-related syndrome, with particularly high rates in oncology professionals and staff [5]. The incidence has been shown to be as high as 50-70% of staff [5-7]. In team environments, such as in radiation oncology, situations of increased job stress and burn-out can lead to impaired cognitive functioning, increasing the potential for patient harm. Consequences of BOS in hospital staff include illness, absenteeism, staff conflict, distrust of management, poor coping and substance abuse. Clinical consequences may include medical errors and adverse events, poor prescribing ▼

habits, low patient satisfaction and low adherence to physician recommendations [4].

Different inherent factors in the individual may be related to the development of BOS. One of the most important is each individual's coping style. Poor coping may lead to impairment in job performance and ineffective coping strategies may lead to a higher likelihood of developing BOS. In general, emotion-orientated coping styles are associated with higher levels of BOS [9]. Certain personality traits may also predispose individuals to develop BOS, including alexithymia and lack of empathy.

Alexithymia is a psychological construct broadly describing individuals with deficits in emotion processing and awareness [10]. Those who score high on a measure of alexithymia show difficulty distinguishing emotions from bodily sensations, discriminating between cognition and emotions, and describing and communicating emotions to others [11]. Empathy is the ability to share and understand another's 'state of mind' or emotion. It is often characterised as the capacity to 'put oneself into another's shoes'. In the healthcare environment, effective empathetic communication enhances the therapeutic effectiveness of the clinician-patient relationship.

The young ESTRO committee developed the PROject on Burn-Out in RadiatioN Oncology (the PRO BONO study) to explore BOS in the field of radiation oncology and to investigate whether alexithymia and levels of empathy affect the likelihood for BOS development. The survey was aimed at all radiation oncology professionals and was completely anonymous. The project is endorsed by the young radiation oncology group (yROG) of the European Organisation for Research and Treatment of Cancer (EORTC).

The project will provide useful information. Being aware of potential risk factors may help in implementing protection strategies for radiation oncology professionals more prone to BOS. Participants were asked to provide some general information and complete three different validated questionnaires (TAS-20, IRI, ProQoL) to investigate alexithymia traits, levels of empathy and to quantify eventual likelihood of developing BOS. The PRO-BONO initiative is a valuable way to address an important issue, to analyse it and to define management strategies for individuals at risk of developing BOS. The results will be presented at ESTRO 38 in Milan, Italy, in April next year.

Pierfrancesco Franco, MD, PhD
Young ESTRO committee chair
Department of Oncology, Radiation Oncology
University of Turin, Italy

REFERENCES

[1] da Costa BRC, Pinto ICJF. Stress, burn-out and coping in health professionals: a literature review. J Psychol Brain Stud 2017; 1:1.

[2] Maslach C, Jackson S, Leiter M. Maslach burn-out inventory manual. Mountain View, CA : CPP. Inc., ad Davies-Black, 1996.

[3] Schaufeli W, Leiter M, Maslach C. Burn-out: 35 years of research and practice. Career Dev Int 2009 ;14 :204-20.

[4] Howlett M, Doody K, Murray J, *et al*. Burn-out in emergency department healthcare professionals is associated with coping style: a cross-sectional survey. Emerg Med J 2015; 32 :722-7.

[5] Truffelli DC, Bensi CG, Garcia JB, *et al*. Burn-out in cancer professionals: a systematic review and meta-analysis. *Eur J Cancer Care*; 17 :524-31.

[6] Whippen DA, Canellos GP. Burn-out syndrome in the practice of oncology: results of a random survey of 1,000 oncologists. *J Clin Oncol* 1991; 9 :1916-20.

[7] Glasberg J, Horiuti L, Novais MA, *et al*. Prevalence of burn-out syndrome among Brazilian medical oncologists. *Rev Assoc Med Bras* 2007; 53 :85-9.

[8] Ciammella P, De Bari B, Fiorentino A, *et al*. The 'BUONGIORNO' project: burn-out syndrome among young Italian radiation oncologists. *Cancer Invest* 2013; 31:522-8.

[9] Watson R, Deany I, Thompson D, *et al*. A study of stress and burn-out in nursing students in Hong Kong: a questionnaire survey. *Int J Nurs Stud* 2008; 45 :1534-42.

[10] Messina A, Beadle JN, Paradiso S. Towards a classification of alexithymia: primary, secondary and organic. *J Psychopathol* 2014; 20 :38-49.

[11] Taylor GJ, Bagby RM, Parker JDA. Disorders of affect regulation: alexithymia in medical and psychiatric illness. Cambridge University Press 1997.

[12] Ioannidou F, Konstantitaki V. Empathy and emotional intelligence: what is it really about? *Int J Caring Sci* 2008; 1 :118-23.

YOUNG ESTRO

Report from the sixth MR in radiation therapy (RT) symposium

Utrecht, The Netherlands
Saturday 30 June - Tuesday 3 July 2018

KATHRINE
RØE REDALEN

Coffee break in the garden outside the Nicolaï Church

The meeting began with an opening reception on Saturday, which included a tour of the MRI linac facility at the University Medical Centre in Utrecht (UMCU). It was very exciting to see the first, 'home-built', version of the MRI linac and to hear the story of its evolution over many years, which has now resulted in a commercial MRI linac for clinical use. There was also an opportunity to see a 7T MRI system in clinical operation at the UMCU radiotherapy department. The meeting's location in Utrecht this year attracted more participants than in previous years, likely due to the opportunities to see the original MRI linac in use and to interact with Utrecht's experienced scientists.

However, the meeting was not only about the MRI linac. The programme was filled with talks relevant to both clinicians and physicists, as well as other radiation oncology professionals. The content ranged from clinical experience with MRI-only radiotherapy to advanced MRI acquisition techniques and on to MRI biomarker studies, machine- and deep-learning, advanced modelling, as well as quality assurance (QA). The scientific committee did a very good job, developing a programme that consisted of short talks from scientists from all over the world, including Europe, Australia and the USA, with plenty of opportunities for interaction and discussion. The scientific talks were supplemented by poster presentations as well ▼

Inside the Nicolaï Church

PhD students enjoying the sixth 'MR in RT' symposium. From left: Kine Bakke (Akershus University Hospital, Oslo, Norway), Kajsa Fridström (Norwegian University of Science and Technology, Trondheim, Norway) and Franziska Knuth (Norwegian University of Science and Technology, Trondheim, Norway)

The conference dinner started with a tour of the Speelklok Museum in Utrecht, introduced by Bas Raaymakers, one of the chairs of the conference

as symposia and debates on the role of MRI and radiotherapy in the future transformation of cancer care.

The meeting was held in the Nicolaï Church and, for many of us, it was the first time that we had delivered a talk in a church. Although it took some time to adapt to the church's acoustics, overall the venue created a nice atmosphere and provided a different experience to other meetings.

In addition, the programme on Monday evening concluded with a talk from snowboarder and former cancer patient Bibian Mentel, who despite several recurrences of cancer has won three gold medals in the Winter Paralympics. Bibian was enthusiastic about her experience of MRI-based radiotherapy, and her talk motivated us to tackle our own personal challenges, as well as providing a different perspective on our research and a reminder of who we do it for: the patients.

The coffee breaks and lunches were held outside in the church's garden in warm, sunny weather, which created a relaxed and sociable atmosphere. The scientific content was supplemented with several social events. There was a barbeque in the garden on one evening and on the final evening we visited the Speelklok Museum, which contains a collection of self-playing musical instruments, many of which are hundreds of years old and still in working order. The conference dinner, which was followed by a party, was also held in the museum.

This was the sixth 'MR in RT' meeting, and my first (but not last) as a participant. A relatively small meeting such as this is a good supplement to the large conferences, since it is focused on a narrower topic and provides an excellent opportunity to mingle with leading scientists in a more relaxed environment.

Kathrine Røe Redalen
Department of Physics
Norwegian University of Science and Technology
Norway

YOUNG ESTRO

ESTRO technology transfer grant (TTG) report: Dual energy perfusion CT development

Host centre: MAASTRO Clinic, Maastricht, The Netherlands

CATHERINE COOLENS

Computed tomography (CT) perfusion assesses temporal changes in attenuation in tissue material by acquiring a series of rapid scans following the administration of an iodinated contrast agent. In recent years, there has been growing interest in the use of CT perfusion as a prognostic imaging biomarker[1]. Despite the recent advances in CT detector and reconstruction methods, the iodine signal enhancement range in tissues remains relatively small due to the inherent low sensitivity of single energy CT (SECT) in differentiating between iodine, bone, and other materials. Dual energy CT's (DECT) material decomposition capabilities allow for better differentiation between iodine and other materials. Furthermore, parameterising the response of the CT scanner specifically to iodine can improve the dynamic signal range, hence improving detectability. By combining DECT's material differentiation, iodine parameterisation, and CT perfusion, it is possible to develop a dual energy perfusion CT (DEPCT) scanning technique to overcome the current limitations and improve the accuracy of imaging-derived pharmacokinetic parameters.

At the Princess Margaret Cancer Centre, in Toronto, Canada, we acquired static dual and single energy scans of a phantom containing various concentrations of iodinated contrast agent [2] to calculate stoichiometric parameters for derivation of Z_{eff} (effective atomic number) for each concentration. On the back of this, and as part of an ESTRO technology transfer grant, I travelled to the MAASTRO Clinic in Maastricht, The Netherlands, at the start of the summer. I was kindly hosted by Professor Frank Verhaegen and his team, to learn more about their spectral modelling and dual energy material decomposition methods. The MAASTRO group has published widely on DECT for brachytherapy and proton planning. During my visit, we investigated the possibility of treating different levels of contrast enhancement at different time points during perfusion scanning as different "tissues" and applied Landry's fitting algorithms. We also discussed possible ways of improving and optimising stoichiometric calibration to improve its response to iodine concentrations.

SpekCalc software, developed by the MAASTRO group, models the scanner's x-ray spectra. Using this software allows for a spectral approach to calculating Z_{eff} and relative electron density, leading to more accurate estimates of iodine concentrations in phantoms. Moreover, ▼

the fitting method for calculating Z_{eff}, developed by Landry *et al.* from Prof Verhaegen's lab, takes into account the contributions from different interaction cross-sections, an important feature when considering high atomic number elements, such as iodine in contrast agents [3]. Additionally, spectral modelling can lead to improved stoichiometric calibration methodology through introduction of appropriate spectral weighting functions.

Based on these concepts, the goal of this grant was to enable modelling of our intra-operative Siemens Somatom FLASH dual energy scanner and to use different material decomposition and calibration methods to derive Z_{eff} and ρe (relative electron density) maps of iodine concentrations. These goals were successfully met and more. We found that incorporating these methods in the development of the dual energy perfusion CT protocol results in more accurate iodine quantification, thus significantly decreasing the uncertainty in estimations of iodine concentrations compared to the uncertainty observed in single energy CT. This reduction was highest in lower concentrations of iodine, which are especially relevant in clinical settings. In addition, it was shown that incorporating the high- and low-energy X-ray spectra in the stoichiometric calibration process leads to scanner-specific parametrisation, resulting in a more robust methodology and subsequently more reliable stoichiometric parameters. These maps of Z_{eff} for clinically relevant iodine concentrations will now be used to redefine the contrast enhancement curves with respect to Z_{eff} with the goal of obtaining statistically significant improvement in dynamic range compared to ρe.

Dr Catherine Coolens, PhD CIPEM
Medical Physics Faculty, Princess Margaret Cancer Centre
Associate Professor, Departments of Radiation Oncology and IBBME, University of Toronto
Affiliated Faculty, TECHNA Institute, University Health Network, Canada
catherine.coolens@rmp.uhn.ca

REFERENCES

[1] Coolens C, Driscoll B, Moseley J, *et al.* Feasibility of 4D perfusion CT imaging for the assessment of liver treatment response following SBRT and sorafenib. *Adv Radiat Oncol.* 2016;1(3):194-203.

[2] Driscoll B, Keller H, Coolens C. Development of a dynamic flow imaging phantom for dynamic contrast-enhanced CT. *Med Phys.* 2011;38(8):4866-80.

[3] Landry G, Reniers B, Granton PV, *et al.* Extracting atomic numbers and electron densities from a dual source dual energy CT scanner: experiments and a simulation model. *Radiother Oncol.* 2011;100(3):375-9.

RESEARCH PROJECTS

RESEARCH PROJECTS

Report from the fourth annual meeting of the ESTRO European Particle Therapy Network (EPTN) task force

28 June 2018

London, UK

DAMIEN C WEBER

CAI GRAU

The fourth annual meeting of the ESTRO European Particle Therapy Network (EPTN) task force was held at University College London (UCL), UK, in June. There were 38 participants from 19 institutions in ten European countries. These numbers reflect the steady increase in the number of new particle therapy facilities operating in Europe, with at least three new centres coming into operation in 2018. The first EPTN meeting, held in 2015, was used to define the roles and tasks of the EPTN work parties. Since then much has been achieved, including the development of questionnaires relating to quality assurance (QA) as well as new guidelines.

This year culminated in eight scientific articles on EPTN work being published in *Radiotherapy & Oncology* in a special issue on proton therapy [1-8]. The accompanying editorial argues that with the combined efforts of the dedicated working groups and institutions, European particle therapy is well placed to move to the next level.

In the report below, you can read about our progress across our seven working parties (WP).

WP1: Clinical

The WP1 clinical group is focused on establishing the content of prospective data registries and assessing methodological strategies for performing clinical research at a European level. At present, there are proposals for a generic assessment and six tumour-specific databases, including central nervous system (CNS), head and neck, lung, oesophagus, breast and prostate. A WP1 consensus meeting took place at Schiphol Airport, Amsterdam, The Netherlands, on 5 September 2018 . The main purpose of the meeting was to reach consensus on the content of these prospective data registries. This endeavour, named ParticleCARE, is a sub-project of the umbrella project conducted by ESTRO and the European Organisation for Research and Treatment of Cancer (EORTC) (E2-RADIaTE). EORTC will set up the IT database infrastructure and will manage the data, while EPTN will set up the governance structures.

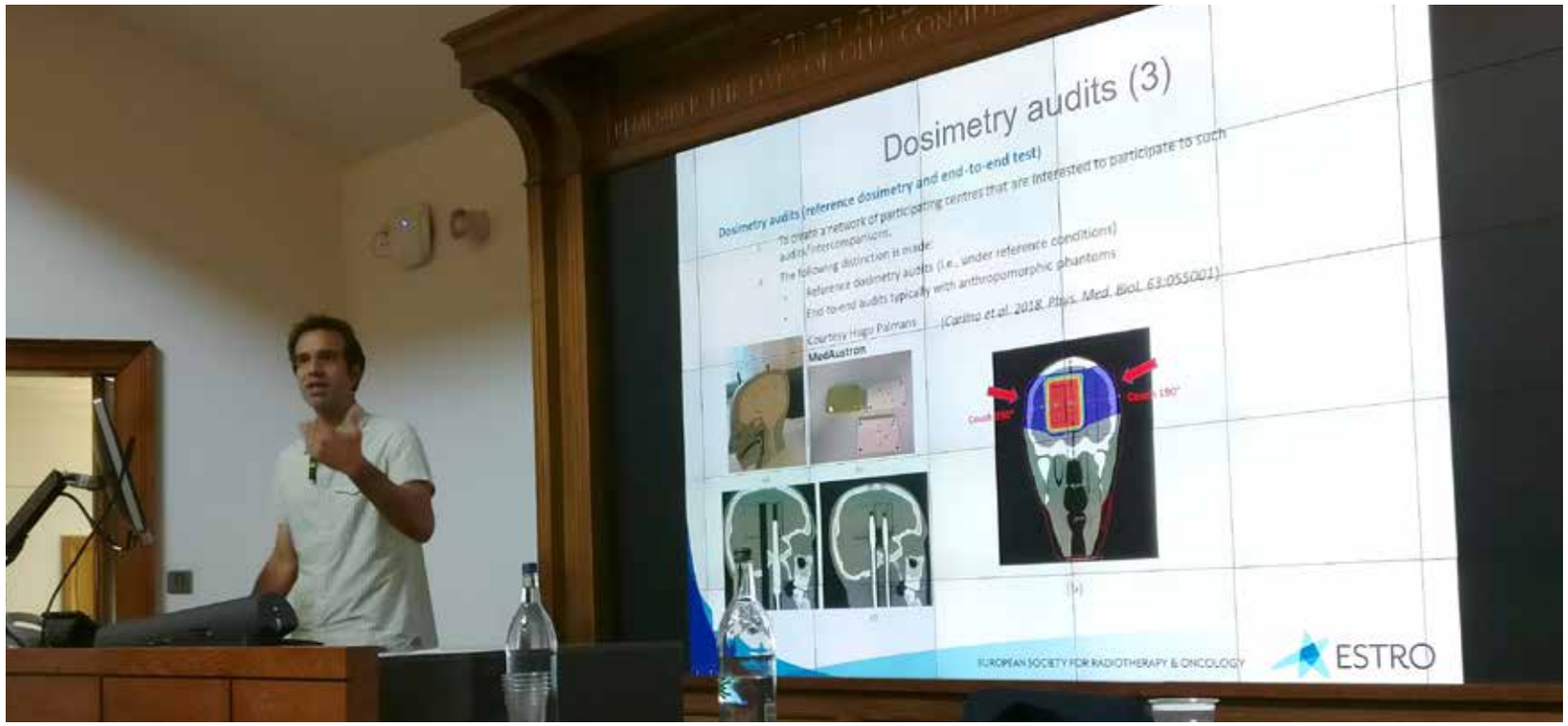
We have published a paper on the background and general aims of the project [5]. In the USA, data registries for adults and children already exist. As far as possible, we plan to link to these registries to facilitate data merging between the US and Europe for future joint research projects. This is crucial given the low incidence and wide variety of tumour types.

WP2: Dose assessment, quality assurance, dummy runs, technology inventory

In total, 27 participants from 21 centres based in ten countries have contributed to the activities of WP2 (as of June 2018).

The second general WP2 workshop was held on 8 May 2018 in Frankfurt, Germany. The workshop focused on the activities of three of the six working groups: (i) the QA / equipment survey, (ii) reference dosimetry, and (iii) audits.

i) **QA / equipment survey:** the survey was distributed at the end of 2017, with an 88% completion rate. The questionnaire collects information about the dosimetry QA tests



Sairos Safai presenting work of WP2

performed and equipment used in centres across Europe, including: type of test and procedure, frequency and duration, tolerance levels, equipment used, level of satisfaction and critical assessment of equipment and procedures. One of the main goals is to verify if a consensus exists among the centres in Europe with respect to the QA programme.

A selection of preliminary results were presented at ESTRO 37 in Barcelona, Spain, in April 2018. We compared results on how different centres conduct daily QA of scanning proton treatment units, observing large variation in the tolerance levels used for similar types of tests. For example, some centres performed range/ energy checks on a daily basis while others did not. The full analysis of the questionnaire is ongoing. However, these preliminary results seem to indicate that there is currently no consensus in Europe. The lack of clear recommendations in the particle therapy community and the variety of beam delivery systems may be the source of this heterogeneity. In this context, WP2 can play an important role in encouraging moves to harmonise the QA programme for particle facilities.

ii) **Reference dosimetry**. We are working on three projects in this area:
1. **Dose-area product (DAP) dosimetry:** to explore an alternative to standard reference dosimetry, using large-area plane-parallel ionisation chambers.
2. **SOBP-based dosimetry validation:** dosimetry performed under reference conditions for a representative set of clinically relevant geometrical fields (SOBP) for comparison between predicted and measured dose. It includes the definition of a standard set of fields and comparison between centres.
3. **Absolute dosimetry with a portable graphite calorimeter:** calibration of ionisation chambers directly in the user beam quality via graphite calorimeter. The UK's National Physical Laboratory (NPL), which contributes to the work of WP2, is introducing this concept for particle facilities in the UK. WP2 plans to expand this collaboration with the rest of Europe.

iii) **Audits:** to create a network of participating centres interested in dosimetry audits and end-to-end intercomparison tests. We are working on the following project:
4. **End-to-end audits with anthropomorphic phantoms:** the MedAustron (Wiener Neustadt) group has developed an end-to-end test with a head anthropomorphic phantom, which can accommodate ionisation chambers and alanine detectors. This phantom and the related dosimetry approach will be used for comparing end-to-end results among centres.

Projects 1, 3 and 4 require on-site visits and networking between institutes. We believe that these projects could be partially supported by the translational access of the EU grant INSPIRE, and therefore we are preparing grant proposals.

Morten Høyer presenting work of WP3

WP3: Education and training

We have conducted a survey of particle centres in Europe designed to map the needs for a particle therapy education and training programme. In total, 18 centres, nine of which already exist and nine of which are being planned or constructed, have responded. The survey results suggest that hiring experienced staff from existing particle centres occurs relatively infrequently, with centres educating and training their own staff instead. Most new centres need to employ and educate a large number of physicians, physicists and radiation technologists during the first years of operation. Established centres have an ongoing need for employing new staff as well as educating existing staff members. The survey showed that all centres send their staff for training at experienced centres prior to the start of operation, but the percentage of staff members and the duration of their stay varied considerably. In total, 45 per cent of physicists stayed for a median of 45 weeks; 31% of physicians for a median of 20 weeks; and 26% of radiation therapists (RTTs) for a median of two weeks.

All new centres are willing to send their staff on application training provided by vendors, ESTRO or the PSI Winter School, whereas established centres are more reluctant to do so.

A first meeting for those interested in contributing to WP3 was held during ESTRO 37 in Barcelona. The meeting was well attended. We discussed the survey results, and decided to work on three educational initiatives: i) to integrate particle therapy into the ESTRO core curriculum, including integrating particle therapy topics into existing ESTRO teaching courses, ii) to establish a masterclass in particle therapy, including a continuous training programme consisting of online teaching courses, workshops and homework, and iii) establishing an inter-centre staff exchange programme.

WP4: Image guidance in particle therapy (IGPT)

WP4 focuses on the importance of imaging and image guidance in particle therapy. We have described the current status of the 19 European particle therapy centres (PTCs) regarding image guidance, including available technologies and clinical procedures, based on the results of a questionnaire sent out in 2016. This survey has been analysed in detail with the support of the sub-WG coordinators, with a focus on image guidance for the different body sites (head and neck, brain, thorax, abdomen and pelvis). The findings have been published [6].

In February 2018, the WP4 coordinators organised a second workshop at the Proton Therapy Centre Czech, Prague, Czech Republic, which brought together 25 participants from 13 centres around Europe. We discussed the following items:

- Specific aims of WP4
- Achievements so far
- Update of the participants in the sub-WG
- Preparation for the next questionnaire
- Definition of the next steps towards establishing a target-specific code of practice and consensus guidelines for IGPT in the clinic. ▼

A literature review of the image-guidance results in particle therapy for each body site has been initiated in each of the sub-WG, considering different aspects, such as patient immobilisation, optimisation of imaging techniques, margins versus robustness, imaging matching methods, and current and new imaging technologies.

This review will form the basis for the new survey and for the clinical guidelines, which will be prepared, taking into account the peculiarities of image guidance for each body site. The next meeting of WP4 will be organised in early 2019 at the Proton Therapy Centre, Azienda Provinciale per I Servizi Sanitari (APSS) in Trento, Italy.

WP5: Treatment planning systems (TPS) in particle therapy

Progress has been made in a number of the sub-tasks being pursued as part of WP5. A collective list of TPS specifications has been published on the **ESTRO website** as a 'reference' document for future proton centres wishing to tender for treatment planning systems. In the 'planning standards' task, and driven by the IPACS consortium, we are developing planning inter-comparisons for head and neck cases between proton centres (a first paper has been submitted). We have also prepared a questionnaire, which will be distributed this autumn to all European proton centres on their policy of patient-specific verifications.

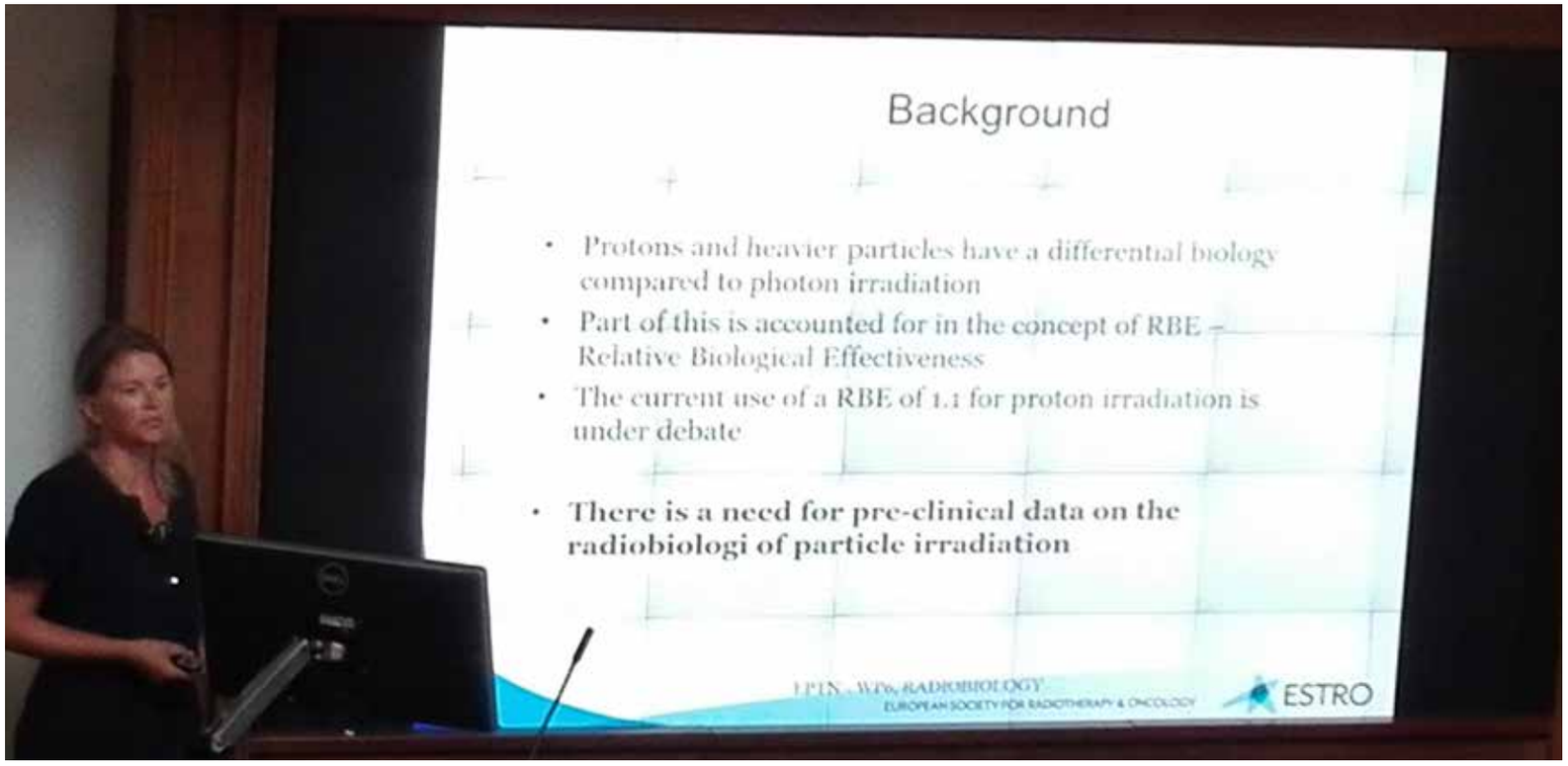
The CT calibration task group has been particularly active and has completed its survey of CT calibration procedures across Europe, the results of which have been published as a poster at ESTRO 37. In addition, a CT calibration inter-comparison phantom has been developed, which is currently travelling around the European proton therapy centres as part of a comprehensive comparison of CT calibration. We will have the results towards the end of 2018 or the start of 2019.

Finally, the task group on robustness has been reviewing and comparing robustness metrics on standard cases in order to move towards a recommended standard for evaluating and reporting plan robustness. In addition, we are initiating a number of new tasks, including LET in TPS, 4D planning and automated planning, the details of which will be discussed at the next meeting of the working group scheduled for November 2018.

WP6: Radiobiology

Protons and heavier particles have a different biology compared to photon irradiation. Part of this is accounted for in the concept of relative biological effectiveness (RBE). The current use of an RBE of 1.1 for proton irradiation is under debate and there is a need for pre-clinical data on the radiobiology of particle irradiation to support the clinic. The aim of WP6 is to form a network of clinical facilities with radiobiological research in order to facilitate research collaborations, standardisation of radiobiological experiments and to coordinate research in order to obtain the data.

To get an overview of existing and planned clinical facilities that use experimental radiobiology, a questionnaire was sent out ▼



Brita S. Sørensen presenting work of WP6

in 2017 to all centres that showed an interest in participation in WP6. Information was supplied from 13 centres and has been summarised in a publication [7].

WP6 had its first network meeting as a workshop at GSI in February 2018. Dr Michael Scholz was the local organiser. The two-day meeting was open to everyone with an interest in experimental particle radiobiology. In total, there were 28 participants from ten centres at the meeting. The intention was to bring people together to discuss points of shared interest, methodological issues and the future work of WP6. The meeting will be an annual event.

At ESTRO 37, as part of the EPTN session, WP6 gave a presentation on the aims and activities of their work.

WP7: Health economics

WP leader Yolande Lievens presented the work of this WP, the aim of which is to develop a knowledge base for the health economics of proton therapy (PT) and to support discussions on resource allocation, reimbursement and access to PT across Europe. In 2016 a survey was developed to collect basic economic data from PT centres. Unfortunately, the response rate was low, which resulted in too few data to be used for detailed modelling of costs.

Last year, Ulrike Kliebsch initiated a critical review of this survey, examining how easy it was to understand and the level of detail included. A recommendation of this review is to approach centres currently in operation, which can provide stable and reliable cost and resource data, with a revised survey. Centres still in the planning or preparatory phase may need to correct and adapt their figures as part of their implementation phase. Another important aspect is to align the work to other initiatives within ESTRO (e.g. the health economics in radiation oncology (HERO) project) and EORTC (e.g. E2-RADIatE platform). To avoid redundant data collection and strengthen collaboration across work parties (specifically WP1), Yolande Lievens attended the WP1 meeting in September to discuss data capture strategies within the context of a clinical data registry to be set up by WP1 using EORTC infrastructure.

WP7 has published a paper on economic data registration needs [8]. It describes the background and characteristics of data collection for two modelling concepts which are necessary for a full economic assessment of particle therapy. The cost-effectiveness analysis shows the relative value of a new intervention compared to the standard of care. In addition, the affordability for the Society is evaluated via the budget impact analyses.

We will continue our efforts to redefine economic data capture. We believed that more involvement of administrative and/or financial staff from particle centres will better represent the users' perspective in this work party. ▼

Collaborative efforts

PTCOG

ESTRO and EPTN have signed a memorandum of understanding with the Particle Therapy Co-Operative Group (PTCOG) to collaborate on education, meetings and scientific exchange. Though largely based in the USA, PTCOG has sub-committees in a number of European countries.

EORTC

EORTC and ESTRO have recently launched a new initiative mentioned earlier in this report, E2-RADIatE (EORTC-ESTRO Radiation Infrastructure for Europe), a platform aimed at generating robust data that can be shared to improve clinical research and ultimately cancer treatment. E2-RADIatE has started off with two projects, Oligocare and ParticleCARE, the latter being named during the meeting in London.

ENLIGHT

The similarity of work between the EPTN and the European Network for Light Ion Hadron Therapy (ENLIGHT) originally launched by ESTRO in 2000 was highlighted. It was decided to explore and draw up a collaborative agreement that would benefit both networks.

INSPIRE

INfraStructure in Proton International Research (INSPIRE) is funded by the European Commission and was launched this year. INSPIRE complements EPTN activities and so has room for collaboration on the following activities: networking, transnational access and joint research activities. WPs (e.g. WP2, 5 and 6) are encouraged to explore collaborations with INSPIRE.

General discussion

The broader aim of EPTN, to integrate PT in radiation oncology, was reiterated. The network would benefit from better visibility on the ESTRO website, which will soon be addressed on the Society's new website. Participation of PT centres in the work of the WPs should be encouraged and be more inclusive. The annual meeting of the network is open to all PT centres in Europe. The collaboration with ENLIGHT should be clarified.

Due to the amount of physics input to EPTN, a physicist co-chair of the network has been recommended by ESTRO's scientific council. A broad consensus was quickly reached Dietmar Georg, medical physicist from Vienna, Austria, was later in September confirmed by the Board of ESTRO as co-chair of EPTN.

The next meeting of the EPTN will be in April or May 2019 at the ESTRO office in Brussels, Belgium.

On behalf of EPTN:
Damien C Weber (Villigen, Switzerland) and Cai Grau (Aarhus, Denmark), EPTN organisers.

EPTN work parties

WP	Title	Coordinators
1	Clinical	Hans Langendijk *(Groningen, The Netherlands) – Leader* Roberto Orecchia *(Milan, Italy)*, Karin Haustermans *(Leuven, Belgium)*, Daniel Zips *(Tübingen, Germany)* Jacques Balosso *(Grenoble, France)*, Esther Troost *(Dresden, Germany)*
2	Dose assessment, quality assurance, dummy runs, technology inventory	Oliver Jäckel *(Heidelberg, Germany)*, Sairos Safai *(Villigen, Switzerland)*, Stefan Menkel *(Dresden, Germany)*
3	Education	Morten Høyer *(Aarhus, Denmark)*, Marco Schwarz *(Trento, Italy)*
4	Image guidance in particle therapy	Aswin Hoffmann *(Dresden, Germany)*, Alessandra Bolsi *(Villigen, Switzerland)*
5	Treatment planning systems in particle therapy	Håkan Nyström *(Uppsala, Sweden)*, Tony Lomax *(Villigen, Switzerland)*
6	Radiobiology	Manjit Dosanjh *(Geneva, Switzerland)*, Bleddyn Jones *(Oxford, UK)*, Jörg Pawelke *(Dresden, Germany)* Martin Prutschy *(Zurich, Switzerland)*, Brita S. Sørensen *(Aarhus, Denmark)*
7	Health economics	Yolande Lievens *(Ghent, Belgium)*, Klaus Nagels *(Bayreuth, Germany)*, Ulrike L. Kliebsch *(Villigen, Switzerland)*

For more information on EPTN, visit: www.estro.org/about-us/governance-organisation/scientific-council/task-forces/european-particle-therapy-network
Or email Evelyn Chimfwembe at echimfwembe@estro.org

REFERENCES

Publications in: *Radiotherapy & Oncology* Vol 128, July 2018 (special issue on proton therapy):

[1] Optimizing clinical research and generating prospective high-quality data in particle therapy in Europe: Introducing the European Particle Therapy Network (EPTN).
Grau C, Baumann M, Weber DC
DOI: https://doi.org/10.1016/j.radonc.2018.06.021

[2] The EPTN consensus-based atlas for CT- and MR-based contouring in neuro-oncology.
Eekers DBP, Ven L, Roelofs E, Postma A, Alapetite C, Burnet NG, Calugaru V, Compter I, Coremans IEM, Høyer M, Lambrecht M, Nyström PW, Romero AM, Paulsen F, Perpar A, de Ruysscher D, Renard L, Timmermann B, Vitek P, Weber DC, van der Weide HL, Whitfield GA, Wiggenraad R, Troost EGC on behalf of the taskforce "European Particle Therapy Network" of ESTRO
DOI: https://doi.org/10.1016/j.radonc.2017.12.013

[3] Radiation dose constraints for organs at risk in neuro-oncology; the European Particle Therapy Network consensus.
Lambrecht M, Eekers DBP, Alapetite C, Burnet NG, Calugaru V, Coremans IEM, Fossati P, Høyer M, Langendijk JA, Romero AM, Paulsen F, Perpar A, Renard L, de Ruysscher D, Timmermann D, Vitek P, Weber DC, van der Weide HL, Whitfield GA, Wiggenraad R, Roelofs E, Nyström PW, Troost EGC on behalf of work package 1 of the taskforce "European Particle Therapy Network" of ESTRO
DOI: https://doi.org/10.1016/j.radonc.2018.05.001

[4] Proton therapy for paediatric malignancies: fact, figures and costs. A joint consensus statement from the paediatric subcommittee of PTCOG, PROS and EPTN.
Weber DC, Habrand JH, Hoppe BS, Kayser CH, Laack NN, Langendijk JA, MacDonald SM, McGovern SL, Pater L, Perentesis JP, Thariat J, Timmerman B, Yock TI, Mahajan A
DOI: https://doi.org/10.1016/j.radonc.2018.05.020

[5] Prospective data registration and clinical trials for particle therapy in Europe.
Langendijk JA, Orecchia R, Haustermans K, Zips D, Balosso J, Lacombe D, Lievens Y, Weber DC, Grau C, Troost EGC
DOI: https://doi.org/10.1016/j.radonc.2018.06.001

[6] Practice patterns of image guided particle therapy in Europe: A 2016 survey of the European Particle Therapy Network (EPTN).
Bolsi A, Peroni M, Amelio D, Dasu A, Stock M, Toma-Dasu I, Nyström PW, Hoffmann A
DOI: https://doi.org/10.1016/j.radonc.2018.03.017

[7] Overview of research and therapy facilities for radiobiological experimental work in particle therapy. Report from the European Particle Therapy Network radiobiology group.

MAKE IT HAPPEN

MAKE IT HAPPEN

Quality in cancer care: making it a European habit

ECCO European CanCer Organisation

www.ecco-org.eu/erqcc

ESSENTIAL REQUIREMENTS FOR QUALITY CANCER CARE

#ERQCC #qualitycancercare

The quality of cancer care matters. The management of cancer care is complex and to achieve the best results for patient coordination and cooperation between disciplines is essential. Each profession brings unique skillsets and insights to the decision-making process on individualised patient treatment. It is multidisciplinarity that ensures such teamwork occurs, and lies at the heart of the European CanCer Organisation's (ECCO) guiding mission.

The ECCO mission is expressed clearly in the **Essential Requirements for Quality Cancer Care (ERQCC) - www.ecco-org.eu/ERQCC**.
The ECCO ERQCC programme aims to:

- improve outcomes for cancer patients in Europe through the adoption and the implementation of essential requirements for quality cancer care in Europe;
- complement existing clinical guidelines and improve their efficacy; and
- shape the policy environment at European and national levels to improve the quality of cancer care across Europe and decrease inequalities in cancer outcomes.

The ERQCC papers are organisational specifications, not clinical guidelines, and are intended to give oncology teams, patients, policy-makers and managers an overview of the elements needed in any healthcare system to provide high-quality care throughout the patient journey. References are made to clinical guidelines and other resources where appropriate.

These new charters for improvement, created for specific tumour types, set out in clear terms the checklist elements required to achieve quality cancer care, including:

- membership and role definitions within the core and extended multidisciplinary team;

- organisation of the cancer patient pathway;
- timelines for care and interventions;
- quality assurance processes; and
- articulation of rehabilitation and survivorship needs.

Download the ERQCC papers here: www.ecco-org.eu/ERQCC/ERQCC-Publications

Access the ERQCC Toolkit here: www.ecco-org.eu/ERQCC/ERQCC-Toolkit

ECCO will continue its scientific and policy work on the ERQCC programme, expanding the scope of focus to breast and prostate cancer in 2018 and ovarian, lung and pancreatic cancer in 2019.

Together we can improve outcomes for cancer patients in Europe.

Richard Price
EU Affairs Policy Manager

CONFERENCES

FORTHCOMING ESTRO EVENTS

FORTHCOMING CONFERENCES ENDORSED BY ESTRO

PAST CONFERENCES

FORTHCOMING ESTRO EVENTS

Congresses

ESTRO meets Asia
7-9 December 2018
Singapore

7th ICHNO - International Congress on Innovative Approaches in Head and Neck Oncology
14-16 March 2019
Barcelona, Spain

ESTRO 38 - Targeting optimal care, together
26-30 April 2019
Milan, Italy

Workshop

6th GEC-ESTRO workshop - Performing optimal brachytherapy
29-30 November 2018
Brussels, Belgium

ESTRO MEETS ASIA 2018

7-9 December 2018
Singapore

Late registration deadline: 5 November 2018

WWW.ESTRO.ORG

#ESTROASIA

ESTRO
European Society for
RADIOTHERAPY
& ONCOLOGY

ESTRO meets Asia

7-9 December 2018
Singapore

Interview with Professors Vincenzo Valentini and Masahiro Hiraoka, chairs of the clinical/radiobiology programme

VINCENZO VALENTINI

MASAHIRO HIRAOKA

Can you tell us about the clinical/ radiobiology programme at the 'ESTRO Meets Asia' conference?

The purpose of the programme is to share the best clinical practice for treating the most common pathologies in Asia and Europe. We will share what we believe is the best scientific evidence and the best use of innovative techniques, drawing on a number of case studies as reference. The topics covered will predominantly relate to head and neck, breast, lung, oesophagus, prostate and gynaecological cancers.

How did you go about selecting the speakers for the programme?

It was an incredibly synergic experience, with strong interaction between the various ESTRO committees and the Federation of Asian Organizations for Radiation Oncology (FARO). Both FARO and ESTRO proposed a list of speakers designed to achieve the right balance of European and Asian clinical expertise and experience.

Can you tell us about the type of research that is going to be presented?

The research being presented at the clinical/ radiobiology sessions will revolve around the most common pathologies in Asia and Europe. As part of this, innovative techniques that have developed around these pathologies creating interesting new scientific evidence will be introduced at the sessions.

Is professional practice of RTTs and clinicians different in Europe and Asia? Will the meeting help to shed some light on these differences?

We haven't found any major differences between professional practices. However, as certain pathologies are more frequent in Asia than Europe (and *vice versa*), some types of cancer more common to that continent offer more possibilities for verifying and putting into practice scientific research and techniques and producing new evidence. The congress will act as a discussion table where participants from both continents will have the opportunity to compare, share and highlight different scientific evidence.

7TH ICHNO

International Congress on innovative approaches in

HEAD & NECK ONCOLOGY

14-16 March 2019
Barcelona, Spain

Early registration deadline:
6 November 2018

MORE INFORMATION:
WWW.ESTRO.ORG

#ICHNO7

ESTRO European Society for RADIOTHERAPY & ONCOLOGY

EHNS www.ehns.org

ESMO GOOD SCIENCE BETTER MEDICINE BEST PRACTICE

7th ICHNO

14-16 March 2019
Barcelona, Spain

Head and neck cancer treatment: Where do we stand and where will we go?

Interview with the chairs of the 7th International Congress on Innovative Approaches in Head and Neck Oncology (ICHNO)

The 7th International Congress on Innovative Approaches in Head and Neck Oncology (ICHNO) is jointly organised by ESTRO, the European Head and Neck Society (EHNS), and the European Society for Medical Oncology (ESMO), and will take place on 14-16 March 2019 in Barcelona, Spain. The conference will shine the spotlight on multidisciplinarity and innovations in head and neck oncology.

Ahead of the conference, we asked the three ICHNO chairs, each representing one of the organising societies, to highlight the latest innovations in the treatment of head and neck cancer.

HANS LANGENDIJK

Hans Langendijk, co-chair of ICHNO, representing ESTRO

Based on developments over the last two years and expected developments in the future, we are moving forward to a more individualised treatment approach.

There is an increasing armamentarium of new diagnostic tools to improve the assessment of tumour extension and the use of 'omics' to improve prediction of outcomes to help us select the best treatment.

There is also an increasing number of treatment options and one of the main challenges in the future will be to select the most suitable options for individual patients and to find the optimal balance between efficacy and treatment-related side effects. How should we integrate emerging technologies in surgery (e.g. image-guided minimal invasive surgery), radiotherapy (e.g. protons and image-guided radiotherapy) and systemic treatment (e.g. immunotherapy) into combined strategies that will provide the most benefit to patients?

These developments also require reconsideration of new endpoints and trial methodologies. As a result, decision-making will become increasingly complex and will involve a greater role for patients – one of the next challenges in the treatment of head and neck cancer. ▼

RENÉ LEEMANS

René Leemans, co-chair of ICHNO, representing EHNS

The role of multidisciplinarity in the management of head and neck cancers is extremely important. The conference will be an opportunity to come together to hear about the latest advances in our disciplines, including surgery, medical oncology, radiation oncology and others, for the benefit of head and neck cancer patients. In each of these modalities, there have been major developments, especially in molecular biology, imaging and pathologic diagnosis and survivorship.

In relation to surgery, we will highlight integrating bio-endoscopy into our management; pushing the limits of robotic surgery for various indications; 3D-planning; the reconstruction of bony surgical defects; and novel developments in sentinel lymph biopsy that may increase its applicability. In addition, we have recently seen an increase in the development of immuno-oncology therapies that have yet to find their way into our multidisciplinary management. This includes both non-surgical therapies and therapies in conjunction with surgery. Several trials are being conducted that address this combined approach.

JEAN-PASCAL MACHIELS

Jean-Pascal Machiels, co-chair of ICHNO, representing ESMO

The most important innovation in systemic treatment is the development of immunotherapy for patients with recurrent squamous cell carcinoma of the head. PD-1 inhibitors improve survival and are a new standard therapy, alongside chemotherapy, radiotherapy, and surgery. However, we still need new approaches to treat unresponsive patients. Innovative new systemic treatments are being investigated to improve treatment efficacy and patient outcomes, and will be discussed at ICHNO.

Immunotherapy also needs to be combined with standard treatments, including surgery, (chemo)radiation, and chemotherapy to improve the efficacy of our primary treatment and increase the cure rate of patients with locally advanced squamous cell carcinoma of the head and neck.

ESTRO 38

26-30 April 2019
Milan, Italy

Targeting optimal care, together

WWW.ESTRO.ORG

#ESTRO38

ESTRO
European SocieTy for
RADIOTHERAPY
& ONCOLOGY

ESTRO 38

Targeting optimal radiotherapy, together

26-30 April 2019
Milan, Italy

Interview with the chair, Professor Dr Umberto Ricardi

UMBERTO RICARDI

"Targeting optimal care, together'' is the theme of the annual congress. Why was this theme chosen? How will this be translated in the congress?

The choice of the conference theme reflects ESTRO's conviction in the importance of multi-professionality and multidisciplinarity in optimal cancer care. That's certainly the meaning of "together" (different professionals within the radiation oncology world and different physicians within the oncological arena); but of course, "together" means also considering patients at the centre of our vision, as well as working together with all the different stakeholders (e.g. policymakers, national societies). Finally, targeting is a key concept for our discipline, and is even more important right now in the era of precision medicine, where cancer treatment should be personalised for every single patient.

What do you think will be the hot topics at ESTRO 38?

Of course, we hope to receive abstracts reporting results from phase III trials. As usual, we will have our different tracks, with updates coming from different standing committees. We will have traditional joint symposia with other scientific societies or organisations (including ASTRO, JASTRO, RANZCR, EORTC, IAEA* etc). In 2019 we will have, for the first time, a joint symposium with the European Association for Cancer Research, confirming the importance that ESTRO places on preclinical research work. Radiomics, artificial intelligence, new technologies (e.g. MR-guided radiotherapy, image-guided adaptive brachytherapy, particle therapy), and the combination of immune-checkpoints inhibitors with radiation will certainly be hot topics at ESTRO 38.

What advice would you give people going to ESTRO 38 for the first time?

The scientific programme will be very broad and dense across the four days; in order to get the most out of the scientific sessions, it will be very useful to download the ESTRO 38 app to plan your agenda. I would also suggest people attending the ESTRO annual meeting for the first time to use the opportunity to further develop their networks and international collaborations. Visiting the exhibition of cutting-edge technologies will certainly be of value. Finally, I would recommend saving some time to enjoy the beautiful city of Milan. ▼

On a personal note, what are you most looking forward to?

ESTRO 38, held in my home country of Italy, will be my first congress as President. I hope it will be a very successful meeting for our Society, for all the speakers and the attendants, as well as for the exhibitors. I also hope that we continue growing our annual meeting, with more submitted abstracts and participants, and a larger exhibition than ever before.

Is there anything else that you'd like to say?

Enjoy your time at ESTRO 38, learning about the latest science, networking, and having fun at the social events!

2,240
ABSTRACTED SUBMITTED
Thank you for contributing to the scientific programme!

Early registration deadline:
16 January 2019

* American Society for Radiation Oncology (ASTRO), Japanese Society for Therapeutic Radiology and Oncology (JASTRO), The Royal Australian and New Zealand College of Radiologists (RANZCR), European Organisation for Research and Treatment of Cancer (EORTC), International Atomic Energy Agency (IAEA)

6th GEC-ESTRO workshop

Performing optimal brachytherapy

29-30 November 2018
Brussels, Belgium

Organised by the GEC-ESTRO Committee, this event has become a hallmark platform for networking with the seven GEC-ESTRO working groups:

- Anal-rectal
- Brachy-HERO
- BRAPHYQS
- Breast
- Gynae
- Head and Neck and Skin
- UroGEC.

The 6th GEC-ESTRO workshop will cover different aspects of not only theoretical but also practical ideas on how to perform brachytherapy in an optimal way. Each working group will cover a site-specific aspect of brachytherapy. Besides the scientific part of the workshop there will also be opportunity for networking and exchanging of ideas amongst the delegates.

We welcome and encourage you to register and join us at the 6th GEC-ESTRO workshop to be held in Brussels, a must for all those with a genuine interest in brachytherapy. Come and learn about our ongoing projects and take the opportunity of networking with like-minded brachytherapy enthusiasts.

Please note that this year again, the working groups will have smaller satellite meetings. We encourage you to contact the working group leaders via echimfwembe@estro.org if you wish to join these meetings and provide your input.

Late registration deadline:
13 November 2018

FORTHCOMING CONFERENCES
Endorsed by ESTRO

Advanced Breast Cancer: fifth ESO-ESMO International Consensus Conference ▶▶
14-16 November 2019
Lisbon, Portugal

The European Lung Cancer Congress (ELCC) ▶▶
10-13 April 2019
Geneva, Switzerland

Advanced Breast Cancer:
Fifth ESO-ESMO International Consensus Conference

14-16 November 2019
Lisbon, Portugal

www.abc-lisbon.org

The International Consensus Conference for Advanced Breast Cancer (ABC) has established itself as the major international conference in this field. The primary goal of the conference is to develop international consensus guidelines for the management of ABC patients. These guidelines are based on the most up-to-date evidence and can be used to guide treatment decision-making in many different international healthcare settings, with the necessary adaptations for different access to care.

Last year's meeting in Lisbon, Portugal, brought together 1,300 participants from 89 countries around the world, including health professionals, patient advocates and journalists. We believe that health professionals, working closely together with patient advocates and the media, can raise awareness of the needs and challenges faced by this underserved and overlooked group of patients. The ABC conference aims to identify research priorities based on the most important areas of unmet need; to analyse and discuss available data to provide accurate management recommendations; and to influence policy-makers and research funders. The ultimate aim is to improve standards of care, survival and quality of life. Research and education, and the effective use of the most up-to-date international evidence, is central to achieving these goals. ▼

ABC5

The creation of the Global Metastatic Breast Cancer (MBC) Alliance also provides a platform for the development of projects designed to impact on the survival and quality of life of ABC patients.

ABC conference guidelines are jointly developed by the European School of Oncology (ESO) and the European Society of Medical Oncology (ESMO). The guidelines have been endorsed and supported by several other international oncology organisations, including ESTRO, the European Society of Breast Cancer Specialists (EUSOMA), the European Society of Gynaecological Oncology (ESGO), Union International Contre le Cancer (UICC), the Senologic International Society (SIS), the International School of Senology (ISS), Federacion Latino-Americana de Mastologia (FLAM), the Organisation of European Cancer Institutes (OECI), Arbeitsgemeinschaft Gynäkologische Onkologie e. V. (AGO), Susan G. Komen® and the Breast Cancer Research Foundation (BCRF). The conference also has official representation from the American Society of Clinical Oncology (ASCO).

It is with great enthusiasm that we invite you to attend the fifth ESO-ESMO Advanced Breast Cancer International Consensus Conference (ABC5), which will be held in Lisbon, Portugal, from 14-16 November 2019. Together we will work to improve the lives of all advanced breast cancer patients.

The European Lung Cancer Congress (ELCC)

10-13 April 2019
Geneva, Switzerland

www.esmo.org

IMPORTANT DEADLINES

9 January 2019	Abstract submission
30 January 2019	Early registration
5 March 2019	Late-breaking abstracts
20 March 2019	Late registration

The European Lung Cancer Congress (ELCC) is a collaborative effort by the most important multidisciplinary societies representing thoracic oncology specialists, working together to advance science, disseminate education and improve the practice of lung cancer specialists worldwide.

ELCC is now the point of reference in the field of thoracic malignancies. Since its inaugural edition in 2008, it has secured its status as the premier meeting for professionals in the field.

Make sure not to miss this interactive, multidisciplinary meeting, involving the top experts who have a specific interest in lung cancer. It takes place 10-13 April 2019 in Geneva, Switzerland.

Medical oncologists, radiation oncologists, thoracic surgeons, respiratory physicians / pneumologists, interventional radiologists and pathologists all benefit from its comprehensive and stimulating programme.

ELCC is an annual event devoted to advancing the quality of lung cancer treatment and finding answers to unsolved problems which can contribute substantially to the improvement of patient survival.

International experts in the field will discuss a full range of topics including:

- Immuno-oncology combinations and biomarkers
- Molecular diagnostics and therapies
- Early detection of lung cancer
- Multidisciplinary treatment of locally advanced disease
- Sequencing treatment in advanced disease
- Small cell lung cancer and mesothelioma.

Congress officers

Scientific steering committee

- Jean-Yves Douillard, Lugano, Switzerland
- Fred R. Hirsch, Denver, Colorado, USA
- Solange Peters, Lausanne, Switzerland
- Giorgio Scagliotti, Turin, Italy

Scientific co-chairs

- Pilar Garrido, Madrid, Spain (European Society for Medical Oncology)
- Jürgen Wolf, Cologne, Germany (International Association for the Study of Lung Cancer)

PAST CONFERENCES
Endorsed by ESTRO

The ultra-high dose-rate 'FLASH' radiation therapy workshop
12-13 September 2018
Lausanne, Switzerland

ECCO 2018 European Cancer Summit
7-9 September 2018
Vienna, Austria

REPORT ON
The ultra-high dose-rate 'FLASH' radiation therapy workshop

12-13 September 2018
AGORA Cancer Centre
Lausanne, Switzerland


JOLYON HENDRY


LOUIE HANCOCK


NATHAN ROCHE

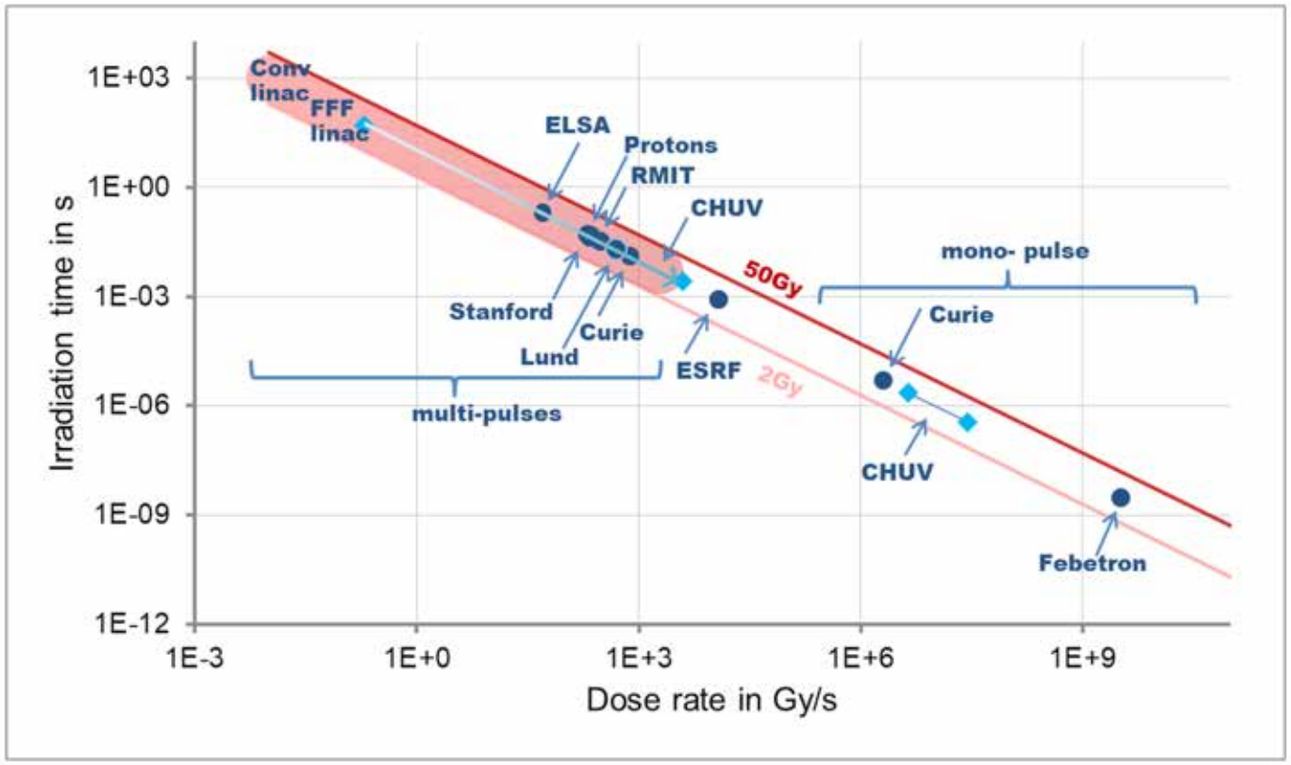

RANALD MACKAY

The second international ESTRO-endorsed workshop on the stimulating topic of ultra-high dose-rate 'FLASH' radiation therapy was organised by Marie-Catherine Vozenin and Jean Bourhis at the Centre Hospitalier Universitaire Vaudois (CHUV) in Lausanne, Switzerland. The 110 participants, who included physicists, radiobiologists and radiation oncologists, discussed new developments and progress towards implementing FLASH as a cancer treatment.

The findings from research show a degree of sparing of normal tissue reactions observed after FLASH irradiation, including in skin, intestine, lung and brain, and also in some feline and porcine subjects. This is consistent with the long-known radiochemical depletion of oxygen in tissues that are not fully oxygenated in normal air-breathing conditions. If a single radiation dose is delivered faster than the re-diffusion of oxygen from un-irradiated regions, there should be a threshold dose (likely tissue-specific) for the depletion from slight hypoxia to near-zero oxygen. Then the tissue should respond to increasing (fast) dose by becoming very hypoxic and radio-resistant. This scenario would enable much higher single doses to be tolerated by some normal tissues, as observed, and to be delivered to solid tumours. Indeed, prolonged growth delay of human tumour xenografts and of tumours in feline cases has already been described. Any definitive changes in tumour local-control probability (TCP) linked to using FLASH instead of conventional dose-rates have not yet been reported. FLASH irradiation has been defined in practical effective terms as delivering ≥40 Gy/second, usually at <1 second, for at most, a few seconds. The FLASH effect declines for longer overall exposure times. Also, at vastly higher dose-rates, there could be other chemical radical reactions that contribute, and any optimum dose-rate needs to be established.

The workshop comprised five sessions of presentations and round tables. The first covered the physics and dosimetry of proton and electron FLASH beams, dosimetric inter-comparisons between groups, and modification of clinical linacs for FLASH production. After this, there were presentations on the physico-chemistry of FLASH effects, DNA damage responses, and vascular and glioma responses to FLASH microbeams. In addition, the sessions covered the differential effects of FLASH versus conventional dose-rates on the intestine, lung, brain and gliomas, and the role of oxygen. ▼

Candidates of FLASH-RT facilities



Jean-François Germond, unpublished data

Modifications of existing clinical linacs to produce FLASH beams were described, for example at Lund University in Sweden. Here, adjustments have been made to the electron gun of an Elekta Synergy system to optimise the beam current and the addition of an associated interlock feedback system for radiofrequency (RF) cut-off and dose control. FLASH therapy requires precise current control down to the number of particles per pulse. Modifications were made to empirically verify the reliability of dosimetric measurements at FLASH dose-rates. ▼

IN MEMORY OF
Dr Elke Bräuer-Krisch

Dr Elke Bräuer-Krisch, our dear friend and eminent scientist at the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, died Monday 10 September 2018. She was 57 and is survived by her husband Michael and their three daughters Jana, Julia, and Anna. Over her career she championed the implementation of novel irradiation modalities to further our understanding of the radiation response of complex biological systems. She focused on the unique properties of microbeam radiation therapy (MRT) that delivered spatially distinct patterns of high dose rate x-irradiation. Many of her studies focused on optimising the physics and dosimetry underlying MRT and how to apply such unique radiation fields to the treatment of tumours using an array of animal models. Her expertise in physics and biology were inspirational to us all and she made a significant impact on our understanding of radiation biology. She will be missed greatly by her family, friends and colleagues.

A new generation of high-gradient linacs will be able to readily deliver FLASH radiation.

There were also presentations on possible delivery platforms with early designs for photons and very-high energy electrons (VHEE). These included magnetic focusing of electron beams on the target providing highly improved conformality, the construction of more efficient and cheaper linacs for FLASH without needing the facility for tumour motion control in conventional treatments, the use of laser accelerated electrons, and new beam types being developed at CERN. A good example is the PHASER project at Stanford University, USA, which is proposing a treatment machine with no moving parts, which maintains pluri-directional delivery due to a novel distributed RF system. This new machine has been designed to deliver photon beams initially, with scope to develop it into a VHEE machine.

The last session discussed the issue of transfer of FLASH technology and pre-clinical experience to human cancer treatment. If successful, this could revolutionise radiotherapy, with the single-shot eliminating conventional treatment times and reducing hospital costs. This remains a real challenge. The technology is progressing at a remarkable rate and very optimised FLASH beams will be produced. More studies are needed on the radiobiology and pre-clinical assessments, especially regarding TCP and implications for therapeutic ratio.

A special issue of *Radiotherapy and Oncology* containing a series of papers on the topics above from the workshop speakers is planned. It will make very interesting reading.

Jolyon Hendry, Louie Hancock, Nathan Roche, Ranald Mackay,
Christie Hospital Medical Physics and Engineering, Manchester, UK

ECCO 2018

European Cancer Summit takes ground-breaking decisions on measurement of quality cancer care, integration of cancer care and survivorship

7-9 September 2018
Vienna, Austria

Over 350 experts and leaders from across the cancer care stakeholder communities met at the ECCO 2018 European Cancer Summit during the Austrian EU Presidency in Vienna on 7-9 September. They decided on how Europe can improve the ways by which quality of cancer care is measured, integration of cancer care is made reality, and how financial discrimination experienced by survivors of cancer can be alleviated.

The three high-level, time-based goals, passed as resolutions by the Summit were:

1. By 2023, an agreed set of core standards and evidence-based indicators (based on processes and patient outcomes) to measure the quality of all cancer services in European countries should be in place.
2. By 2025, all national cancer plans in Europe should contain ambitious and measurable ▼

goals and actions to improve the integration of primary care professionals and informal carers within the multidisciplinary care given to patients.

3. By 2025, in respect to accessing financial services*, the right of cancer survivors not to declare their cancer ten years after the end of the active treatment**, and five years if they had cancer under the age of 18, should be codified across European countries.

A set of defined actions will transpose the resolutions into practice. The complete list of resolutions and supporting actions are available at www.eccosummit.eu/Resolutions

Virtual working groups will assist in developing and implementing the action plans, supported by, reporting to, and with guidance from the ECCO Oncopolicy Committee (OPC) and ECCO Patient Advisory Committee (ECCO PAC). Progress will be reported during the ECCO 2019 European Cancer Summit on 12-14 September in Brussels, Belgium.

ECCO President Philip Poortmans said: "These resolutions represent the essential intention of the ECCO European Cancer Summit: to form and drive consensus on the actions necessary to ameliorate delivery of cancer care in Europe and to improve outcomes and experience for all cancer patients. It is time for the entire European cancer community to join forces to bring these aspirations of improvement into reality."

Presentations from the ECCO 2018 Summit are available at www.eccosummit.eu/Programme

*For the purposes of this resolution, "financial services" are understood to refer to services and products provided to consumers and businesses by financial institutions such as banks, insurance companies, brokerage firms, consumer finance companies, and investment companies (Source: investorwords.com)

**For the purpose of this resolution, "active treatment" does not include maintenance treatment with hormonotherapy, immunotherapy, targeted therapy or other such therapies based on sound and increasing evidence.

ECCO2019
EUROPEAN CANCER SUMMIT

SAVE THE DATE
12-14 September 2019
Brussels, Belgium

EUROPEAN CANCER CARE: ACROSS BORDERS

ecco **European CanCer Organisation**

eccosummit.eu
#eccosummit

CALENDAR OF EVENTS

NOVEMBER 2018

2-4 NOVEMBER 2018 | RIMINI, ITALY

XXVIII National Congress AIRO 22 NOVEMBER 2018

www.airo2018.com

ESTRO ENDORSED EVENT

14-16 NOVEMBER 2018 | LISBON, PORTUGAL

Advanced Breast Cancer - 5th ESO-ESMO International Consensus Conference

www.abc-lisbon.org

ESTRO ENDORSED EVENT

---

17 NOVEMBER 2018 | BRUSSELS, BELGIUM

BRAVO symposium 2018: Fighting breast cancer with innovative radiotherapy

www.bravo-radiotherapie.be/fr/bravo-symposium

ESTRO ENDORSED EVENT

---

22 NOVEMBER 2018| POZNAN, POLAND

Young Scientists Forum 2018

www.wco.pl/ysf2018/en

ESTRO ENDORSED EVENT

22-24 NOVEMBER 2018 | POZNAN, POLAND

Interdisciplinary oncology - time for modern solutions

www.onkologia2018.pl

ESTRO ENDORSED EVENT

29-30 NOVEMBER 2018 | BRUSSELS, BELGIUM

6th GEC-ESTRO Workshop

www.estro.org/congresses-meetings/items/6th-gec-estro-workshop

ESTRO EVENT

DECEMBER 2018

7-9 DECEMBER 2018 | SINGAPORE

ESTRO meets Asia 2018

www.estro.org/congresses-meetings/items/estro-meets-asia-2018

ESTRO EVENT

8-9 DECEMBER 2018 | SHANGHAI, CHINA

The 3rd World Precision Medicine (China) Summit

wpmcs.com.cn

ESTRO ENDORSED EVENT

09-12 DECEMBER 2018 |MAASTRICHT, THE NETHERLANDS

Big data imaging

bigdata4imaging.info

ESTRO ENDORSED EVENT

14-15 DECEMBER, 2018 | ROME, ITALY

6th Annual UPMC International Symposium on Stereotactic Radiosurgery and Stereotactic Body Radiotherapy

www.estro.org/binaries

ESTRO ENDORSED EVENT

JANUARY 2019

17-18 JANUARY 2019 | CAIRO, EGYPT

11th Breast Gynecological International Cancer Conference

www.bgicc.net

MARCH 2019

14-16 MARCH 2019 | BARCELONA, SPAIN

7th ICHNO

www.estro.org/congresses-meetings/items/7th-ichno

ESTRO EVENT

APRIL 2019

26-30 APRIL 2019 | MILAN, ITALY

ESTRO 38

www.estro.org/congresses-meetings/items/estro-38

ESTRO EVENT

JUNE 2019

18-21 JUNE 2019 | VIENNA, AUSTRIA

International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (IDOS 2019)

www.iaea.org/events/idos2019

ESTRO ENDORSED EVENT

19-22 JUNE 2019 | BANGKOK, THAILAND

PROS - Congress of the international paediatric radiation oncology society

intpros.org/congress/next-pros-congress

ESTRO ENDORSED EVENT

19-22 JUNE 2019 | DUBROVNIK, CROATIA

ESOI Oncologic Imaging Course 2019 - Oncologic Imaging in the era of precision medicine: Challenges and opportunities

intpros.org/congress/next-pros-congress

ESTRO ENDORSED EVENT

CREDITS

ESTRO
Bimonthly newsletter
N° 121 | November - December 2018
European Society for
Radiotherapy & Oncology

Published every two months and distributed by the European Society for Radiotherapy & Oncology.

DEADLINES FOR SUBMISSION OF ARTICLES IN 2018 AND 2019
January-February 2019 > 2 November 2018
March-April 2019 > 2 January 2019
May-June 2019 > 2 March 2019
July-August 2019 > 2 May 2019
September-October 2019 > 2 July 2019
November-December 2019 > 2 September 2019

If you want to submit articles for publication, please contact the editor: cecile.hardon@estro.org

For advertising, please contact: valerie.cremades@estro.org

ARCHIVE
Latest issues of the newsletter can be found on the ESTRO website under www.estro.org/about and older issues are accessible on DOVE, from the home page of www.estro.org.

ESTRO
European Society for
RADIOTHERAPY
& ONCOLOGY